

Remedium

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August 3, 2010

Ms. Bonita Lavelle
US EPA Region 8
EPR - SR
1595 Wynkoop Street
Denver, CO 80202-1129


1192613 - R8 SDMS

Dear Bonnie,

Attached is the Kootenai Development Impoundment Dam Toe Drain Inspection Report prepared by Billmayer & Hafferman, professional engineers of Kalispell, MT. You will recall that the April 1, 2010 Inspection Report had been forwarded to your office on April 26, 2010. This current report (July 27, 2010) completed the investigation of the toe drains and develops conclusions regarding the findings.

Please advise if there are any questions.


Robert R. Marriam

Cc: W. M. Corcoran (w/out attachments)
R. J. Medler (w/out attachments)

dwp
Enclosure

JUL 29 2010

KOOTENTAI DEVELOPMENT IMPOUNDMENT DAM
TOE DRAIN INSPECTION II REPORT

July 27, 2010



BILLMAYER & HAFFERMAN, INC.

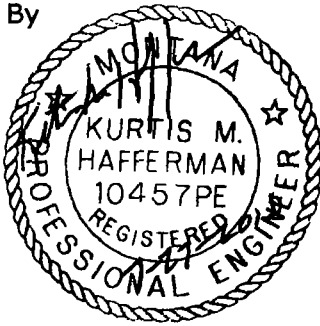
2191 3rd Ave E.
Kalispell, Montana 59901

Report prepared for
Remedium Group, Inc.
6401 Poplar Ave.
Memphis, TN 38119

KOOTENTAI DEVELOPMENT IMPOUNDMENT DAM
TOE DRAIN INSPECTION II REPORT

BHI File No.: R.56.6

By



Kurt Hafferman, P.E.
July 27, 2010



BILLMAYER & HAFFERMAN, INC.

2191 3rd Ave E.
Kalispell, Montana 59901

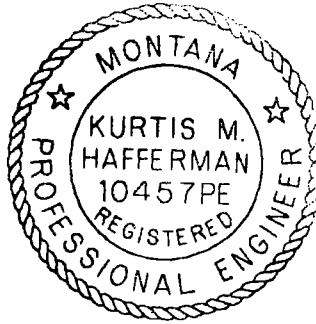
Statement of Qualification of the Professional Engineer

Kootenai Development Impoundment Dam Toe Drain Inspection Report

I declare that to the best of my professional knowledge and belief that I meet the definition and have satisfied the licensing requirements of a Licensed Professional Engineer in the State of Montana as defined in all of the Statutes and Rules applicable to the Board of Professional Engineers and Professional Land Surveyors as described in Title 37, Chapter 1, Part 3 in the Montana Code Annotated Uniform Regulatory Act passed by the Legislature in 1995 including all Administrative Rules pertaining to engineering and land surveying that are written and adopted by the Board of Professional Engineers and Professional Land Surveyors.

I declare that I have the specific qualifications based on education, training, and experience to assess a property of the nature, history, and setting of the subject property and that I have developed and performed the appropriate inquiries in conformance with the standards and practices.

I declare that I have personally performed the data collection and completed this report titled the Toe Drain Inspection II Report for the Kootenai Development Impoundment Dam, know as the subject property. This assessment has revealed the conditions discussed in the attached report in connection with the property. I declare that the statements made in this report are true to the best of my belief and professional knowledge.




Kurtis M. Hafferman, P.E.

MT PE 10457

7-27-2010
Date



BILLMAYER & HAFFERMAN, INC.

2191 3rd Ave E.
Kalispell, Montana 59901

Executive Summary

BHI previously conducted an investigation of the 12 toe drains at the base of the embankment in order to determine the total length and location of the terminal end of each drain. The inspection determined that the drains installed in the KDID do not match the plan drawings and only drain 6 and drain 3 appear to match the plan drawings. The conclusion of that investigation recommended that six projects be conducted to further understand the condition of the drains.

On May 10th through May 21st, the six projects were completed. The outlet of drain 3 was removed, the pipe was cleaned and it was found that drain 3 terminates in broken pipe and gravel matrix approximately 142 ft. from the terminal end. Twenty feet of the end of the drain 7 were removed and drain 7 was found to be broken and has been completely blocked by the roots of the cottonwood tree. The outlet end of drain 2 was removed and it was discovered that drain 2 is an 18-inch corrugated metal pipe that had been reduced to a 12-inch pipe by field fabricating and elbow from corrugated metal pieces. The outlet end was replaced with a new 12-inch HDPE and drain 2 was inspected and determined that the pipe ends in a broken concrete pipe and pile of gravel 42 ft. from the outlet end of the pipe. A video camera inspection of drain 6 showed that there is a cross drain that is discharging water into drain 6 approximately 342 ft. from the outlet end.

The results of the second camera investigation confirm that 11 of the KDID drains have been crushed or broken and terminate in a pile of gravel and broken pipe. It was determined that there is no gravel toe berm but that each pipe was wrapped in a gravel collar during the original construction. Water that flows into the embankment flows in the gravel around the pipe and exits out of the remaining outlet end when possible and out of the gravels where no drain pipe exists. There is no ability to stop water from leaving the gravel collar or controlling where it flows into the collar.

BHI concludes that the original drain system of the KDID has been compromised and the only component that is relatively intact is drain 6, but we believe its capacity has been decreased. All other drains are in poor to very poor condition and it is the opinion of BHI that they have exceeded their useful life and that there is no factor of safety in the toe drain system. It is our opinion that any form of damaging event such as minor flooding, minor to moderate earthquakes, or a sudden change in internal conditions can collapse another section of drain pipe inside the dam or somehow change how water flows in any of the gravel collars. Any of these events could create an immediate change in the drain system and could cause water to emerge from gravels at the toe, from the down stream face of the embankment above the toe drains, or rise up through the toe area uncontrolled. It is our opinion that under no circumstances must this particular dam have any water seeping or running uncontrolled on the downstream face or in the toe area that could cause any form of erosion and sediment transport. Therefore we recommend that an alternative drainage system at the toe of the KDID, or a way to bypass the drain system, must be investigated and a plan implemented in order to avoid future damage.

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Introduction

On Monday March 1st, Tuesday March 2nd, and Wednesday March 3rd a video camera inspection of nine (9) of the twelve (12) toe drains on the Kootenai Development Impoundment Dam (KDID) was conducted by Billmayer & Hafferman Inc. (BHI). The inspection was conducted to meet the requirements of the DNRC Water Resources Division, Dam Safety Operational Permit, Condition 2, which required that the exact location of the terminal end (the furthest upstream end) of each of the drains needs to be mapped.

At the conclusion of the investigation, it was determined that the drains installed in the KDID do not match the plan drawings available and the only drains that appear to match the plan drawings are the center drain, drain 6 and drain 3. The conclusion of that investigations recommended that six projects be conducted to further understand the condition of the drains system. Upon completion of these projects, BHI is to show the following;

1. Does drain 3 terminate in a 6-inch perforated cross drain? If so, it may indicate that all other drains originally terminated in the same cross drain but have since collapsed.
2. Determine if there is a gravel toe berm near drain 11 that may explain why the drains end in gravel piles.
3. Determine if there is a cross drain connected to drain 6 that may confirm the original statements as well as explain where water is either collected from or may be flowing out from drain 6.
4. Determine if the surface water near piezometer A8 is emerging up from the foundation or laterally through the embankment.

On May 10th through May 21st, the six projects were completed by BHI with assistance from Chapman Construction of Libby, Montana (Chapman). This report will provide the results of the construction projects, videos and still photographs from videos of the inside of the drains from the re-inspection, will provide a discussion of the four issues raised, provide plan and cross section views and will provide an opinion of the overall condition of the KDID toe drain system.

Procedure

The project was conducted at the toe of the KDID embankment which is located inside the Exclusion Zone and access is restricted to 40-hour HAZWOPER trained and Level C equipped personnel. Kurt Hafferman, P.E. from Billmayer & Hafferman Inc. was the Project Manager and Field Team Leader and Jeff Robertson, Brandon Chapman and Jeremy Peterson from Chapman Construction were the Site Safety and Health Officer and labor force. All personnel are 40-Hour HAZWOPER trained and certified and have current 8-hour refresher course certifications.

The scope of work for this project was to conduct the following tasks;

1. The break in drain 2 needs to be repaired. As the break is near the surface and easy to access, the pipe can be excavated and a new segment added to the end of the drain.
2. Drain 3 needs to be further inspected and the outlet end of drain 3 needs to be removed and allowed to drain out the water and dirt in the invert. Once the end is removed the pipe is to be cleaned and then re-inspected with the video camera. A camera capable of at least 400 ft. is to be available. Once the pipe is cleaned and inspected, the outlet end from the headwall down was placed on a ¾-inch angular rock base and correctly aligned from the concrete headwall to prevent siltation at the outlet.
3. The void space at the terminal end of drain 11 needs to be excavated. As the terminal end of the drain is located less than 15 ft. from the end and as the overburden above the end is estimated to be less than 5 ft., the area around the end of drain 11 is to be excavated and that washed drain rock be placed in the void space. While the excavation occurs, it will provide an opportunity to investigate the embankment material around the drain and determine if there is more gravel present that may be indicative of a toe berm.
4. A push camera was used that had 400 ft. of length. The intent of using a video camera capable of lengths greater than 300 ft. was to determine if the cross drains discussed in the Harding Lawson report at approximately 200 ft, from the toe of the embankment, can be located.
5. Remove the outlet end of drain 7 and see if it is possible to find the rest of the drain pipe and clean the pipe and inspect the length.
6. Install three shallow hand-augured piezometers near the existing piezometer A8. Monitor piezometers during the spring flows of 2010 to determine the correlation to drain flows, A8 piezometer rises and the appearance of seepage below the toe of the embankment.

The projects were started on Monday, May 10th and concluded Friday May 21st. Access to the site each day was with the 2-ATV's and all personnel were equipped with Level C protective equipment. Chapman had previously brought a 580 Case Backhoe to the site. BHI provided the following construction materials and inspection equipment;

1. 400 ft. Sewer Eye® video camera
2. 9-inch TV/VHS recorder, 3 VHS tapes
3. 400 ft. of 1 ½-inch aluminum push rod in 9.65 ft. end-to-end lock joint sections
4. 2-12 volt marine batteries
5. Sokkia B21 Level, legs, 300 ft. fiberglass tape measure and survey grade fiberglass rod
6. Assorted field books, pencils, tape measures, and miscellaneous tools and instruments
7. 2 – 20 ft. 12-inch diameter HDPE pipes
8. 2 – 20 ft. 8-inch diameter HDPE pipes
9. 3 -20 ft. sections 1 -1/2 -inch PVC pipes with caps
10. 3 -20 ft. sections ¾ -inch galvanized electrical conduit
11. Piezometer drive heads, filter fabric, and a 10 ft. push rod
12. Well probe for monitoring phreatic water surface during and after construction
13. Marsh McBirney flow meter to measure drain outflows

The first project carried out was the removal of the end of drain 7. It was determined that the cottonwood tree that was growing adjacent to the end of the pipe (to the left looking downstream) had completely engulfed the end of the drain with thick roots. A photograph of the roots near the outlet is shown in Figure 1 below.

FIGURE 1: OUTLET OF DRAIN 7 AT COTTONWOOD TREE



The tree roots had completely filled the interior of the drain for the full 20 ft. and an additional 5 ft. of the roots were removed from the pipe into the embankment. Not all of the roots and debris could be

removed from the pipe and we could not reestablish flow into the pipe. The excavation was terminated at 20 ft. as the depth of overburden on the embankment side was unsafe and no further excavation could be conducted without shoring or radical fill removal. It was interesting to find that the drain had been placed in a $\frac{3}{4}$ -inch round gravel collar that extended 12-inches all around the pipe. A photograph of the drain rock collar around the pipe is shown in Figure 2 below;

FIGURE 2: DRAIN ROCK AROUND DRAIN 7



A new 20 ft. 8-inch HDPE pipe was placed at the end of the existing pipe and bedded in the gravel matrix. Water was found to be flowing in the gravel matrix below the old pipe invert and emerging from the gravel below the outlet end of the pipe so the invert of the new pipe was lowered, the slope was steepened and slots were cut into the pipe in hopes of capturing some of the flow in the gravel. A photograph of the new outlet is shown in Figure 3.

FIGURE 3: NEW OUTLET DRAIN 7



When the construction was expanded to include removing the tree, it was necessary to have the 580 Case in the stream and around the wet area below drains 7 and 8. At the conclusion of the project to repair drain 7, it was decided to remove the silt and organic debris from around the outlet of drain 7 and drain 8 and clean the area to make it easier to observe of seepage in this area. At the conclusion of the project the stream banks near the outlet of drain 7 and drain 8 and area near drain 6 was smoothed to a uniform grade, minus the cottonwood tree. A photograph of the final grade is shown in Figure 4 below.

FIGURE 4: FINISHED AREA NEAR DRAIN 8, DRAIN 7, AND DRAIN 6



The repair to outlet of drain 3 was the second project completed. The Case 580 was used to excavate and remove the last five (5) feet of the outlet. It was determined that there is not a concrete headwall at the end of the pipe but is rather compacted earth and roots that are vertical above the pipe. It appears that the lower pipe was not well connected to the upper pipe and somehow, assumed to be from frost expansion, rose in a level plane, leaving a vertical wall of dirt and roots above the up stream pipe. Once the excavation was cleared it was determined that there is a collar of drain rock around this drain as well. It is noted that the drain rock was larger and more angular than the rock around drain 7. A photograph of the outlet end of drain 3 just as the backhoe is excavating the last section of pipe and showing the water as it is starting to drain from the outlet is shown in Figure 5 below.

FIGURE 5: DRAIN 3 OUTLET



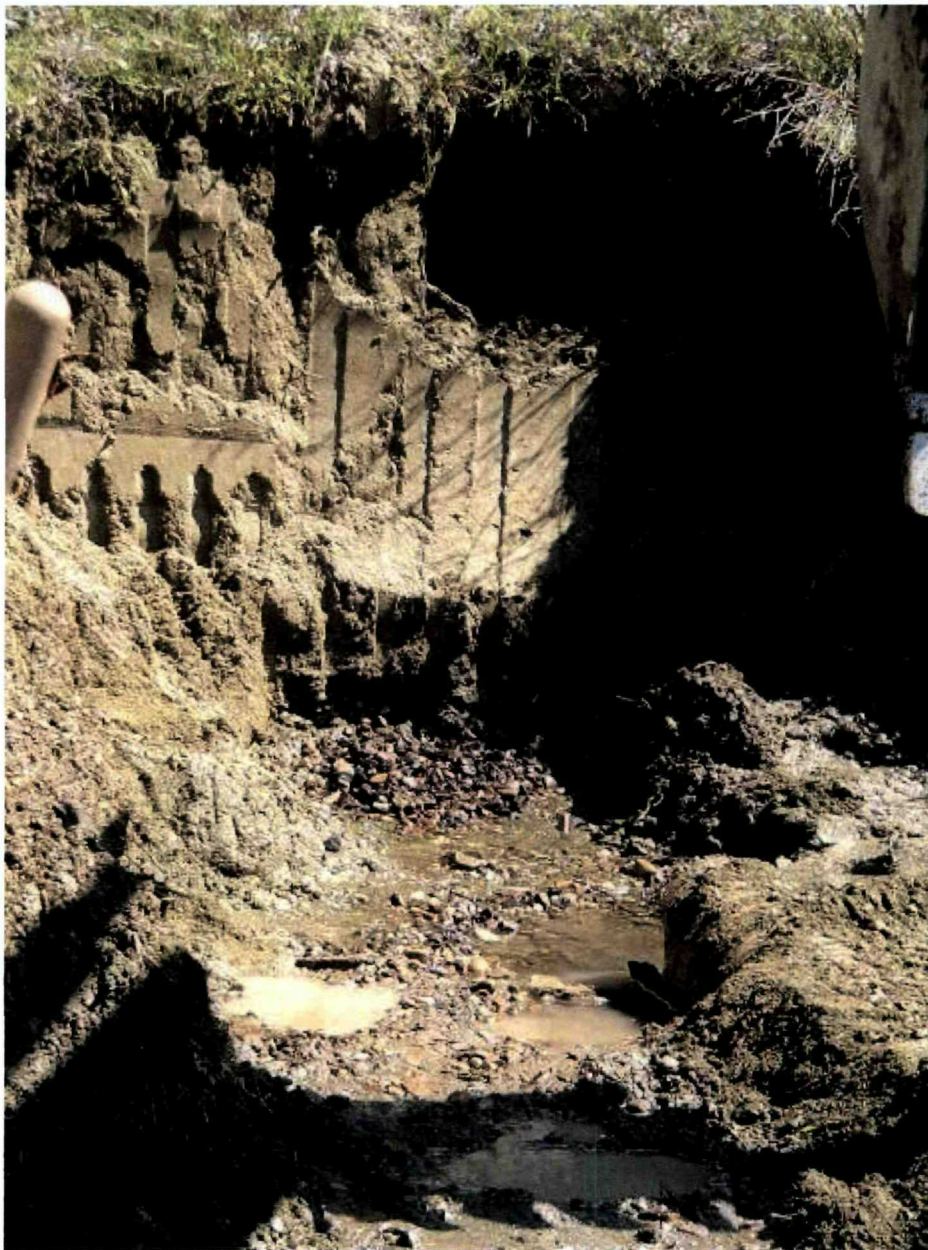
When the end was removed, water with some silt, some sand and a black colored water, assumed to be organic deposits, flowed out of the pipe for several minutes. Once the pipe was clear, the video camera was used to inspect the interior of the pipe. Once the camera inspection was completed, a base of $\frac{3}{4}$ " minus, crushed aggregate was compacted up to the invert of the existing pipe, a new outlet was placed on the compacted fill, and then covered with more $\frac{3}{4}$ - inch minus and compacted until completed to grade. The grade around the outlet was shaped to match the existing slope, top soil was spread and the area was seeded with a native riparian seed mix. A photograph of the outlet as finished is shown in Figure 6 below.

FIGURE 6: DRAIN 3 AS FINISHED



The third project was to remove the outlet end from drain 11, excavate the void space and explore the embankment at the end of the drain. The 580 Case was used to remove 3 sections of concrete pipe which was a total of approximately 15 ft. The void space collapsed as soon as it was exposed. Excavation at the end of the drain revealed the same condition as was found at drain 3 and drain 7; the pipe is encased in a gravel collar. It was unusual to find that the end of drain 10 was also located in the same gravel matrix and also terminated at the same location as drain 11. It was also interesting to note that the gravel around drain 10 and drain 11 is a 1 ½ -inch to ¾ -inch round rock. A photograph of the gravel at the end of drain 11 and the terminal end of drain 10 is shown in Figure 7 below.

FIGURE 7: TERMINAL END OF DRAIN 11 AND DRAIN 10



There was a large piece of an intact concrete pipe found at the end of drain 11 and pieces of broken pipe and gravel near drain 10. Some exploration was made into the embankment to either side but no other section of drain pipe was found, no other signs of gravel or drain rock was located and no other material, other than the embankment material, was near or around the pipe or gravel collar. The invert of the gravel collar was cleaned to the same inert elevation as the existing pipe and a new 15 ft., 8-inch pipe was placed in the gravel collar. Approximately 10 ft. from the end of the excavation, a large amount of water was found to be flowing in the gravel matrix below the invert of the old pipe. Therefore the invert was excavated deeper and 6 ft. of 12-inch HDPE pipe was placed on the end of the 8-inch pipe with the intent of collecting flow from the gravel as well as from the inside of the pipe. The

12-inch pipe was brought to the outlet location next to drain 10 and the area was filled with $\frac{3}{4}$ -inch minus aggregate, compacted and smoothed to the final grades. Topsoil was placed on the fill and seeded with a riparian seed mix. A photograph of the outlet at the final grade is shown in Figure 8 below.

FIGURE 8: FINISH GRADE DRAIN 11 AND DRAIN 10



The fourth repair project was to excavate drain 2 near the area where the pipe bends 22° toward the embankment and a break in the pipe was noted in the previous video investigation. The area at the break was excavated and it was discovered that it is an elbow that was field constructed from pieces of corrugated metal that also reduces the main drain from an 18-inch CMP into a 12-inch CMP. Over the years the water must have worked its way out of the pipe at the elbow and gravel and dirt deposited inside the pipe at the gaps in the elbow. The pipe coming out of the embankment, an 18-inch CMP, was in poor to very poor condition. The metal in the pipe was thin and there was rust corrosion on the inside and outside of the pipe. A photograph of the pipe near the elbow is shown in Figure 9 below.

FIGURE 9: DRAIN 2 NEAR ELBOW



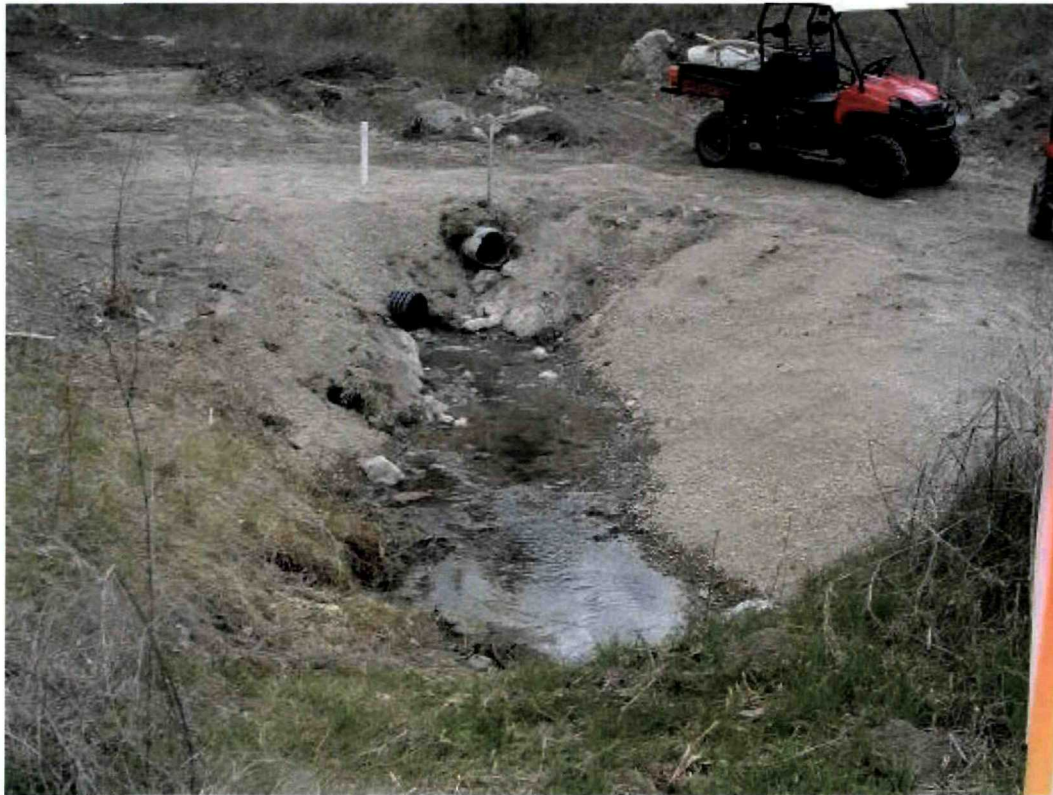
We carefully cut and removed the end of the pipe at the toe of the embankment. A photograph of the end of the pipe at the cut is shown in Figure 10 below.

FIGURE 10: DRAIN 2 AT CUT



A new 12-inch, 20 ft. HDPE was inserted inside of the 18-inch CMP and extended to the outlet location, which is now near to drain 1. We filled the void space between the 12-inch and 18-inch pipes with solid plumber's oakum, then pieces of polyurethane foam and then backed the foam with liquid expanding urethane foam. Once the urethane foam had cured, we backfilled the pipes with compacted $\frac{3}{4}$ - minus aggregate and smoothed and shaped the ground surface. A photograph of the finished grade at the outlet is shown in Figure 11 below.

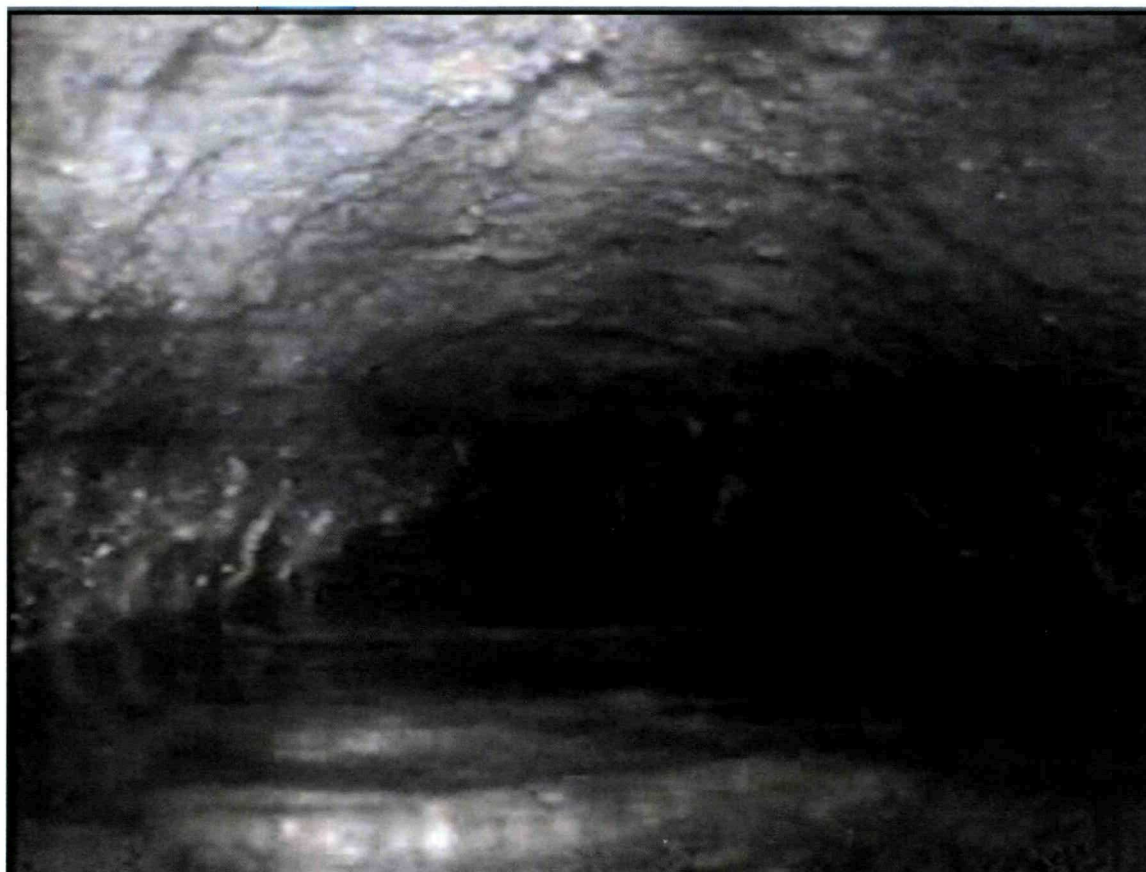
FIGURE 11: FINISHED GRADE AT OUTLET OF DRAIN 2



The fifth project was to video camera the inside of drain 6, drain 3 and drain 2. We prepared the video equipment that was capable of inspection of 400 ft. of total drain length. In drain 6 we were to look for the cross drain, in drain 3 obtain the total length and find the terminal end, and in drain 2 find the terminal end. Still photographs captured from the video are provided in Appendix 2 to this report. Copies of the VHS tape were transferred to CD. The CDs are provided in Appendix 4.

The video camera was set up on drain 3 first. The camera was able to go into the pipe but at 32 ft. from the outlet the camera again went underwater just as it had during the first inspection. The camera was removed and cleaned and reinserted in to the drain. A still picture of the drain near the area before the camera goes underwater is shown in Figure 12 below.

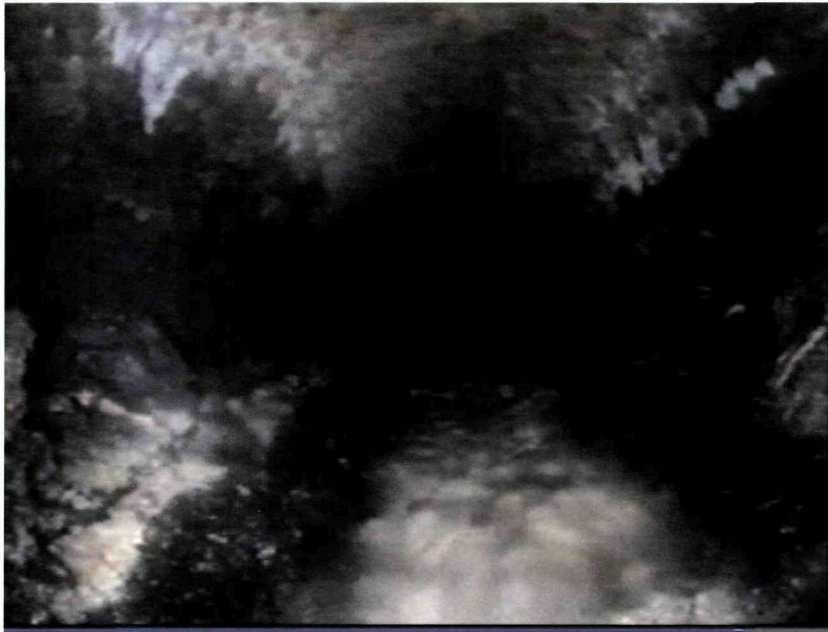
FIGURE 12: DRAIN 3 DOWNSTREAM OF THE LOW AREA



The notes in the field and the review of the video show that the top and bottom of the pipe in drain 3 is apparently gone or has broken and eroded down. As shown above, there does not appear to be a pipe in the ceiling and it appears that the earth is arched over in the previous pipe location. Where the pipe has disappeared to is an unexplained anomaly.

There is a pool of water that the camera sinks into beyond this point and the water quickly turns black and no picture can be seen. Once the camera reaches 54 ft., it emerged out of water and goes back into a solid concrete pipe. A still picture of the pipe as the camera emerges from the water is shown in Figure 13 below.

FIGURE 13: DRAIN 3 UPSTREAM OF LOW AREA.



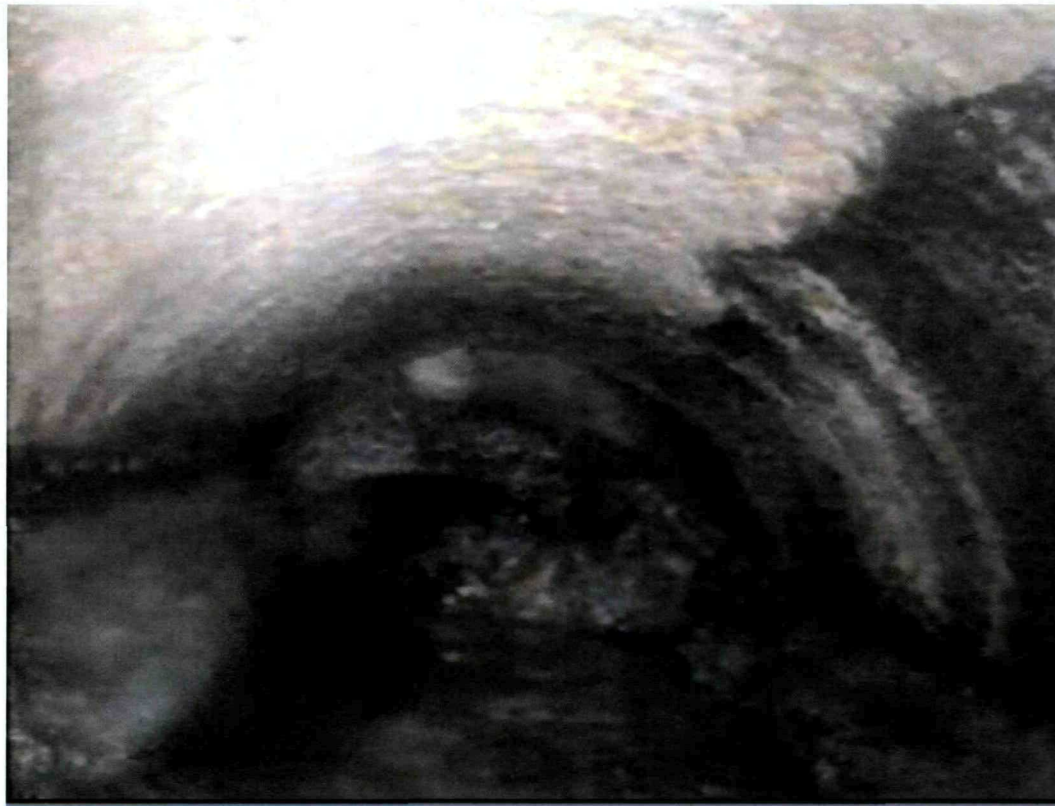
The camera then travels through approximately 80 ft. of open sections of pipe and at approximately 137 ft. the camera encounters a broken section of pipe and a change in invert elevations where water can be seen pouring over a lip of sediment. A still photograph from the video is shown in Figure 14 below.

FIGURE 14: BROKEN CONCRETE PIPE IN DRAIN 3 AT 137 FT.



Finally at 142 ft. from the end of the pipe the camera was blocked by gravel and rocks and the concrete pipe was broken. A still photograph from the video in at the end of the drain is shown in Figure 15 below.

FIGURE 15: TERMINAL END OF DRAIN 3.



The video camera was then set up on drain 2. The camera was able to video the inside of the drain for 42 ft. (20 ft. of new HDPE and 22 ft. of old 18-inch CMP) where we again encountered a blockage in the pipe. The terminal end of the CMP was at the outlet end of a broken concrete pipe and there was a pile of gravel, rocks and water. A still picture from the video at the end of drain 2 is shown in Figure 16 below.

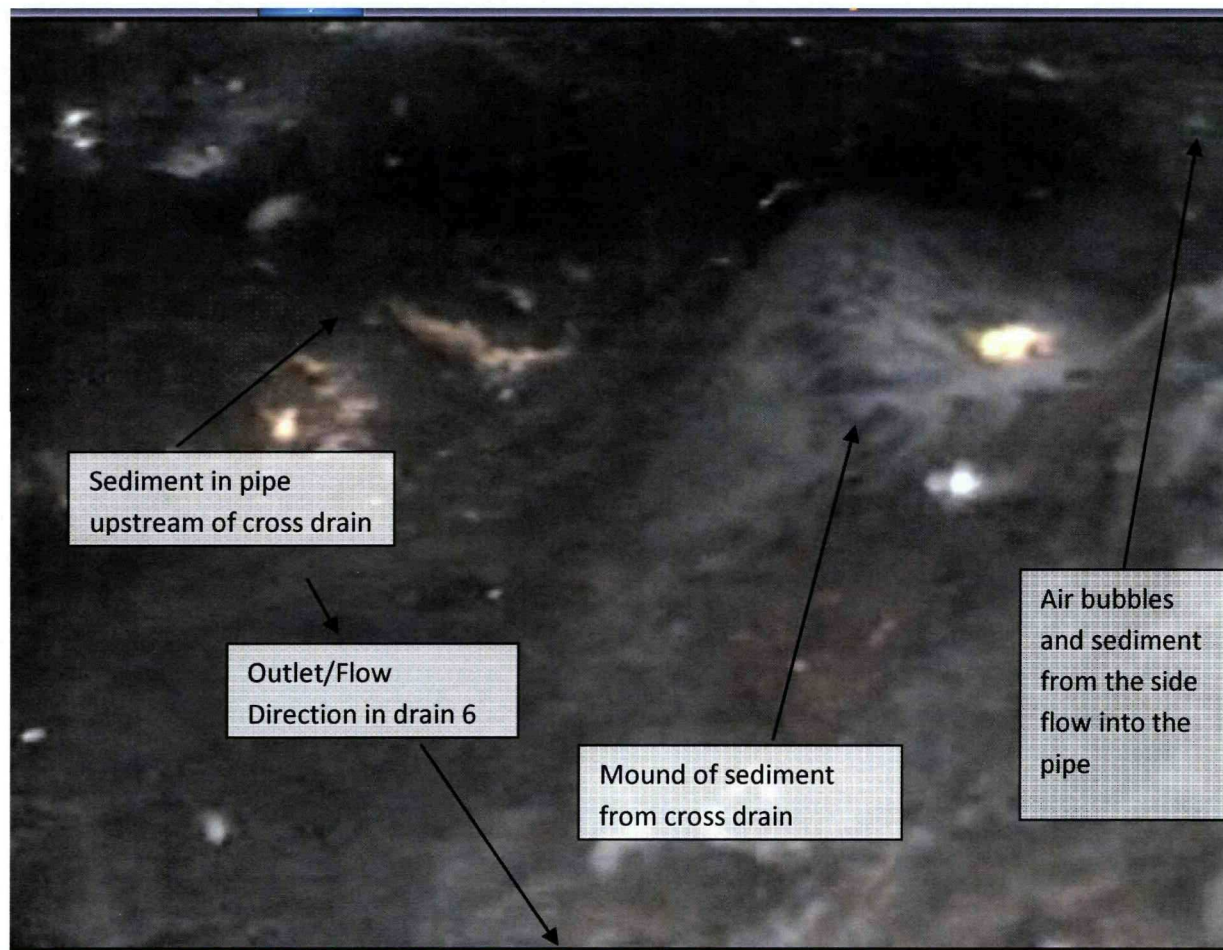
FIGURE 16: TERMINAL END OF DRAIN 2, AT BROKEN CONCRETE PIPE



The video camera was set up at drain 6 last. We were able to get the camera into the drain but the flow was still deeper than the camera and the force of the water appeared to push the camera down. Once again the camera was focused on the invert of the pipe but the picture was clear and the surface of the pipe can be seen in the video. By the time the camera reached 200 ft. into the pipe, the force of the water on the camera and push pipe was causing the camera to be forced backward and we were required to apply force to keep it in the pipe. We were able to push the camera 320 ft. into the pipe when we encountered a heavy black silt discharge coming out of the pipe. We noted that the depth of water over the camera had appeared to decrease as the surface of the water can be seen and at one point the camera can be seen slightly out of the water.

After review of the video it was found that at approximately 320 ft. the sediments on the bottom of the pipe start to increase and was the cause of the sediment discharge increase from the end of the pipe. At 342 ft. there is a mound of sediment on the right side of the screen. Upon closer inspection air bubbles and sediment movement can be seen entering from the right and it is apparent that this is the location where the cross drain must enter the main drain. The still photograph from the video is shown in Figure 17 below.

FIGURE 17: DRAIN 6 AT 342 FT.

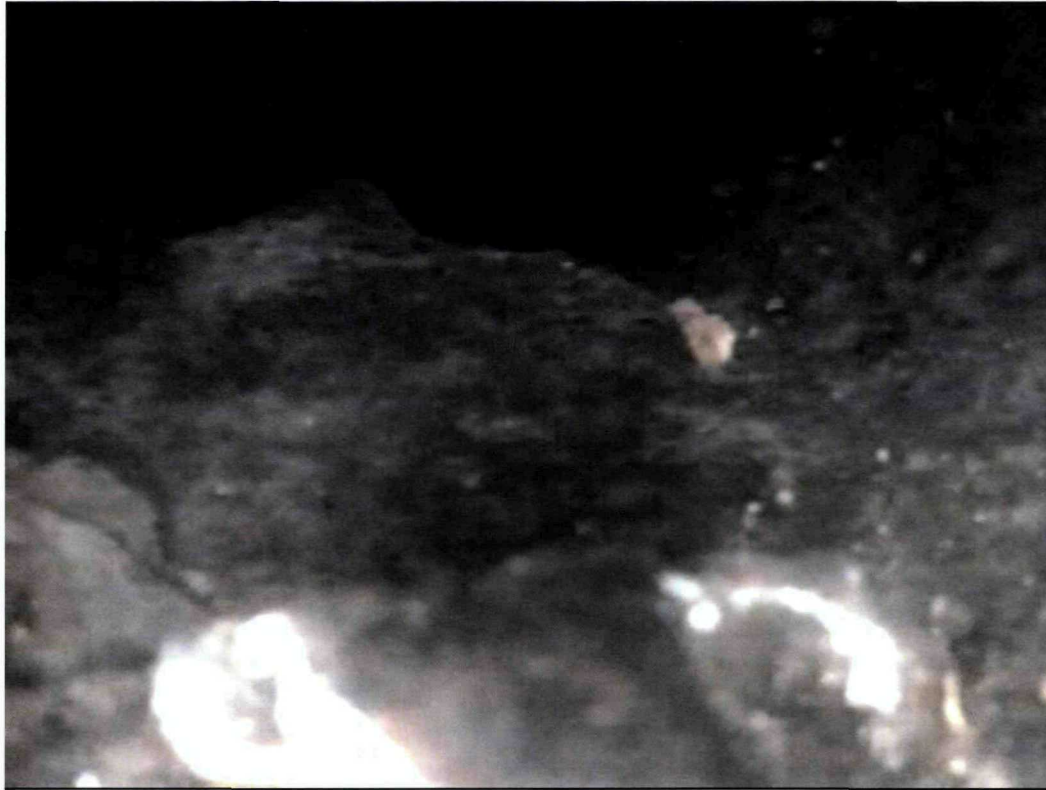


The saddle shape on the right shown in Figure 17 is the mound of sediment from the cross drains and the white, smoke like traces in the top of the photograph, and in the video, are the air bubbles and sediment particles from the right side and from the upstream inflow mixing. Close inspection of the video shows the turbulence in this area that can only be from the side flow into the drain. We assume that as the two flows mix, the water becomes turbulent, losses energy, and drops the heavier particles of sediment in the invert of the pipe.

The camera was pushed to a full length of 352 ft. when the resistance on the camera and sled had increased to the point that Chapman's laborers could not keep the camera in the pipe without the force of two people holding the camera in while the third operated the push tube extensions. You can see the camera slide back and forward from the force of the water as Chapman changes push tube sections or repositions to get a better grip on the pipe. Eventually, if Chapman had let go of the pipe it would have rapidly ejected from the pipe and likely jammed into a worker or lodged into the pipe. Once safety of the workers or integrity of the drain became an issue the investigation ceased.

At the point where the camera stops in the video it is apparent that there are silt deposits. These are indicative of sediment depositions that fall out of the water as water slows or could be deposited from soil infiltrating into the pipe. There is more drain pipe beyond the camera view but it could not be safely accessed. A photograph of the sediment near the end of the drain is shown in Figure 18 below.

FIGURE 18: SEDIMENT NEAR END OF DRAIN 6.



The last project was to install the three shallow piezometers. The 580 Case was used to excavate three holes to a depth of 6 ft. below the ground surface; one near drain 2, one near drain 1 and one south of piezometer A8. Once the holes were excavated the end of the $\frac{3}{4}$ -inch conduit was filled with filter material, covered with a drive shoe, and then driven to refusal, typically within 2 ft. below the bottom of the excavation. The conduit piezometers were covered with 1-1/2 inch PVC pipe casing, backfilled, cut off 2 ft. above the ground surface, and then protected with a 1 1/2-inch PVC screw on cap. The piezometers are labeled A9, A10, and A11. A9 is near the toe of the embankment by drain 2, A10 is between the outlet of drains 2 and drain 1 and piezometer A11 is 50 ft. south of piezometer A8. The top of all the casing were surveyed to establish elevation by using A8 as the known elevation.

It is interesting to note that the excavated material near A11 was a very coarse material with large 1 ft. to 2 ft. diameter boulders in a coarse gravel and sand matrix. There were lenses of coarse sand in the matrix that appeared to be water layers at approximately 4 ft. below the ground in the hole south of A8. A photograph of the excavation is shown in Figure 19 below.

FIGURE 19: MATERIAL NEAR PIEZOMETER A10.



The two other holes were mainly fine grained silt, sand and rocks to 6 feet below ground surface. Why there is a difference in the geology is not clear other than to assume the area near drain 1 and drain 2 was embankment or other fill material and the area south of A8 was assumed to be native material.

A photograph of the piezometers A9 and A10 after they were final graded is shown in Figure 20 below.

FIGURE 20: PIEZOMETERS A9 AND A10 NEAR DRAIN 2 AND DRAIN 1



The last project, placement of the piezometers, was completed on Friday May 21st, 2010. Chapman was on site during the week of May 23rd to May 27th, at various times, completing final grading, seeding, watering seeded areas and cleaning up wood and brush from the project.

On Thursday June 3rd, the routine owner's inspection was conducted and a final inspection of the construction areas was conducted. Chapman had cleaned all areas, removed all debris, seeded all areas and the project was determined to be completed.

Discussion

Photographs of the construction project are provided in Appendix 1 to this report. Photographs are numbered and labeled for reference.

Break in drain 2. The break in drain 2 turned out to be poor construction of an elbow by the last contractor. This pipe is now in very poor condition having rust corrosion inside and out and the metal was very thin. We were able to cut the pipe with the tip of a hand shovel. A photograph of the pipe where it was cut is shown in Figure 21 below;

FIGURE 21: DRAIN 2 AT ELBOW



As discussed above, the video camera inspection showed that the 18-inch CMP ended in a collapsed or broken concrete pipe at 42 ft. from the outlet which we estimated to be 21 ft. into the embankment. A still photograph at the location where the pipe was cut is shown in Figure 9 and Figure 10 above and the still photograph at the terminal end is shown in Figure 16 above.

At the point of the collapse, we have estimated there is at least 12 ft. of overburden and excavation into the embankment. To find the break in the pipe is not possible without exhaustive shoring and excavation. Even if the break could be exposed, it is likely that it will be a concrete pipe that has collapsed further inside the embankment. The pipe was half filled with rocks, silt and sand with black organic silt in the matrix. A photograph of the material in the pipe after the pipe was cut open is shown in Figure 22 below.

FIGURE 22: MATERIAL IN THE INVERT OF DRAIN 2



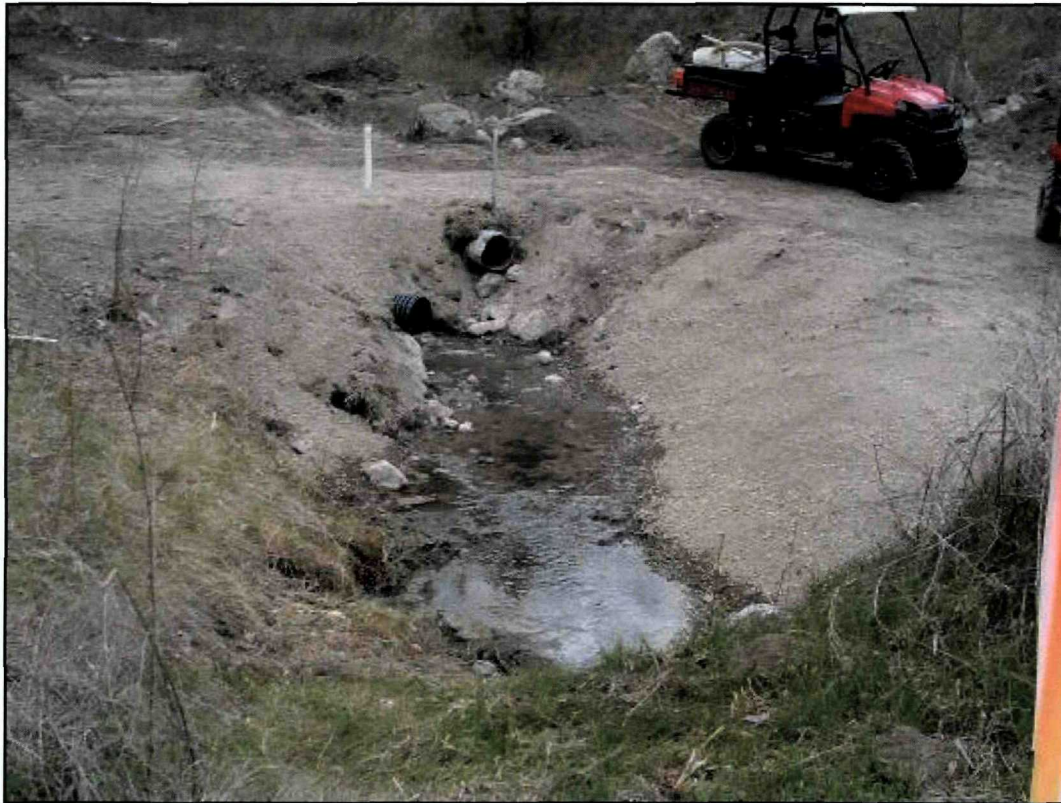
It is felt that the repairs to the elbow in drain 2 may help to stop the seepage water at the toe but do little to improve drain 2.

There was no water on the surface of the ground this year but it is important to note that amount of flow in drain 2 was noted as being low to much lower than normal and that drain 1 did not run at all this year, which is unusual. Therefore it is unknown if the repairs stopped the seepage or if the low flow

affected the seepage. Further monitoring will be required to determine if the water source was from drain 2.

Once drain 2 had been repaired the outlet was extended to the area near the outlet of drain 1. This was done to allow all of the water from the drains to be in one channel and to allow video camera inspection of drain 2 if needed. A photograph of the outlet and final grading is shown in Figure 23 below.

FIGURE 23: FINISH GRADE DRAIN 2 OUTLET



Drain 3 Repair and Inspection

During the first video inspection of drain 3 the video camera was submerged in water and it was assumed that the shift in the outlet was damming up the water in the pipe. When the outlet was removed during this project the amount of debris and water that ran out of drain 3 after the outlet was removed was less than expected. The pipe did have some silt and sand deposits near the outlet that were easily cleaned, but we expected to see water run for several minutes and to either carry debris out of the drain or leave it as deposits in the pipe. That did not occur and the water ran in excess of normal drain flow for two to three minutes then leveled out and was back to normal within minutes.

After we completed the video inspection discussed above and after review of the recorded video, we could see that there is a section approximately 32 ft. from the outlet where the camera goes

underwater and no picture can be seen. We estimate this occurs for 20 ft. and then the camera reemerges in an open pipe approximately 54 ft. from the outlet as shown in Figure 13 above.

We now realize that there must be a section in the pipe where water is in the pipe but at an elevation that is below the invert and the water cannot drain out. The normal drain flow exits over a lip at the downstream end but the pool is always present. Further inspection of the video in this area seems to show a section where there is either no pipe on the ceiling or the pipe is intact and covered with dirt and roots. In either case, the bottom has eroded out and created a "belly" in the invert where water sits. A still photograph taken from the video in this section is shown in Figure 12 above. As can be seen the roof is rough and there are roots that are growing in the pipe. It is our opinion that more than likely, there is not a pipe in this section and the hole where the pipe was, still remains open. This conclusion seems to be supported when the camera emerges from the water at 52 ft. and goes into a well defined pipe section. It may be that this section where there is no pipe would be ready to collapse and would be the new terminal end of the pipe.

The last section of drain 3 just before the terminal end is shown in Figure 14 above. A complete section of pipe can be seen and there is sediment deposited on the invert such that water can be seen flowing over a lip and it appears there is a shift or displacement of the pipe.

At the last section of pipe, drain 3 terminates in the same type of broken concrete, gravel, rock and water matrix that appears in all the other drains.

The only difference between drain 3 and the other concrete pipe drains is that the end of the pipe was at 142 ft. from the outlet rather than within 20 ft to 50 ft. of the outlet end. Otherwise, drain 3 has the same problem as all other drains; the terminal end is at a collapse in the pipe.

Drain 11 Investigation

As discussed above, the investigation of drain 11 revealed that there is no gravel toe berm that the drains are stubbed into. As shown in the descriptions and photographs above, each drain is encased in a gravel collar and when the pipe breaks or collapses, the gravel falls into the drain. Therefore it is now evident that there is no toe berm and the gravel seen in each pipe is from the gravel collar.

Camera Investigation

The video camera investigation revealed that the only drain that resembles the plan drawing is drain 6. Drain 6 appears to be open for the entire length, the metal is still intact, and we have located at least one cross drain that enters the pipe at about the location shown on previous drawings. The investigation, as discussed, reveals that drain 3 and drain 2 ends in a pipe of broken concrete, rocks and debris.

Results

The result of this investigation conclusively determined that all of the toe drains, except drain 6, have been broken or crushed. In all cases it appears that the water continues to flow in the gravel matrix around the pipe and then flows into the pipe at the toe where it is still open or flows in the gravels under the pipe as in drain 7. All of the drains except drain 6 and drain 3 terminate very near the toe of the dam. As discussed above, drain 6 is at least 352 ft. long and drain 3 is 142 ft. long. Only drain 6 appears to function as planned.

Shown below in Table 1 are the final lengths of each drain and a description of the terminal end.

Table 1: Toe drain Lengths and Terminal End Descriptions

Drain	Push Tube Pipe Sections	Additional Length	Total Length	Location Comment
1	10	3	99.7	12-inch CMP for 20 ft. then 10-inch RCP. Clean and clear for a total of 89.4 ft., then pipe takes a turn to the left (looking up the pipe) into the embankment and camera could not negotiate turn.
2	4	3.5	42.2	Original investigation was 20 ft of 12-inch CMP then angle left (into the embankment). End of pipe was removed and determined that 18-inch CMP was necked down to 12-inch at bend by using pieces of corrugated metal (hand fabricated 60 degree elbow). A 12-inch HDPE pipe was inserted into the 18-inch CMP and the outlet end was straightened so that bend was approximately 5 degrees left. Camera investigation revealed that pipe terminated 42 ft. from new outlet in a pipe of rocks, sand and roots.
3	14	7	142.1	Originally thought to continue on well beyond end of camera, total length unknown. In May of 2010 outlet end was removed and the drain was clean and re-video taped. Determined that total length was 142 ft. and ended in a pipe of rocks and concrete pipe debris.
4	1		9.7	End terminates in rock and debris
5	3	3	32.0	End terminates in rock, debris pile
6	35	4	352.3	In March of 2010, pipe continues on well beyond end of camera, total length unknown. Camera underwater for most of the length of the inspection. In May of 2010 camera length was increased. Camera traveled 342 ft. into pipe and was stopped by debris and force of water. At 342 ft. a pile of sediment was encountered, water from a cross drain was noted as coming into the pipe and the total flow decreased.
7	2	1.5	20.8	Then end was previously an 8-inch RCP that was completely blocked by roots. 20 ft. of pipe was excavated and roots removed in May of 2010 and replaced with a 20 ft. section of 10-inch HDPE. Length is current open length
8	1	9	18.7	End terminates in rock and debris
9	4	5	43.7	End terminates in rock and debris
10	1	4	13.7	End terminates in rock and debris
11	1	5.5	15.2	End terminates in rock and debris with void. Void repaired in May 2010, void filled with 2-inch round rock and 15 ft. of HDPE added to end
12	6	2	60.0	Debris (rocks and sand) stop camera from continuing further into pipe. Appears that pipe may go further than debris. No water in pipe beyond 51 ft.

Conclusions and Recommendations

The initial questions in the introduction to this report and the answers are shown below;

1. Does drain 3 terminate in a 6-inch perforated cross drain? If so, it may indicate that all other drains originally terminated in the same cross drain but have since collapsed.
 - a. The inspection of drain 6 and the original toe drain plans would seem to indicate that there is a cross drain manifold. It may be that at some point all the drains did connect to the manifold and it is likely that the gravel collar around each pipe still is hydraulically connected to the manifold. Drain 3 has collapsed so it was not possible to confirm that the drain was connected to a manifold. No drains are directly connected with a central manifold and any assumption that they do, or did, connect is purely speculation.
2. Determine if there is a gravel toe berm near drain 11 that may explain why the drains end in gravel piles.
 - a. There is no gravel toe berm. Drains were encased in a gravel envelope or gravel collar and that is what is appearing in the drains after they collapse.
3. Determine if there is a cross drain connected to drain 6 that may confirm the original statements as well as explain where water is either collected from or may be flowing out from drain 6.
 - a. There does appear to be a cross drain located at 342 ft. from the outlet end of the pipe on the left side of the pipe, looking downstream (right side in the video). It appears that water is flowing into drain 6 which was evident by the air bubbles and sediment deposits at the cross drain location. It appears that water mainly enters the pipe and does not appear to be leaving the pipe. There was not a corresponding cross drain located on the opposite side of the pipe. Based on the size, shape and location of the sediment deposits, based on the video, we assume that drain 6 is still connected to at least the left side of the original manifold.
4. Determine if the surface water near piezometer A8 is emerging up from the foundation or laterally through the embankment.
 - a. The elbow in drain 2 was obviously leaking water and could have been the cause of the surface water. There was no surface water near the toe this year and no water has been monitored in any of the new shallow piezometers. There were low to very low flows in Rainy Creek this year and low flows in drain 2 and no flow in drain 1. No flow in drain 1 is unusual. The new piezometers will be monitored next year and if there is flow in drain 1 and drain 2, a conclusion will be made after the monitoring data is gathered and analyzed.

The conclusion of this second camera investigation is that 11 of the KDID drains have been crushed or broken and terminate in a pile of gravel and broken pipe. We have also determined that there is no continuous gravel toe berm but rather each pipe is surrounded by a collar of uniformly sized gravel. We have found that the gravel around the different drains varies from a ¾ -inch round rock, to a 1 ½ -inch round rock, to a 1- ½ -inch round and angular mix.

In the BHI report on the Piezometer and Toe Drain Discharge Monitoring of February 2010 it is noted that the phreatic water surface in piezometer P2 on the upstream face of the embankment rises as much as 30 ft. to 40 ft. above the foundation level. In the previous Toe Drain Investigation Report we noted that the Harding Lawson report, *Stability of Slopes*, page 15 of 22, stated *"...we believe that the groundwater level immediately upstream of the embankment does not rise above the foundation level."* We originally assumed that when Harding and Lawson wrote the report in 1991, they measured no groundwater rise above the foundation level. It may be that the drains within the dam had already collapsed but had not reduced flow capacity, it may be that sometime between 1991 and 2006, they collapsed, or it may be that Harding and Lawson did not have phreatic water surface measurements and speculated that the phreatic water surface did not rise above the foundation.

A cross section and plan view of the dam showing the location of the drain outlets in relation to the toe of the embankment and the terminal end of each drain is provided in Appendix 3. In addition a plan view showing the existing drains and previous drains is also included. The currently known lateral extent of the seasonally wet piezometers is shown on the plan view and the location of the highest phreatic water surface elevation and the normal low phreatic water surface elevation are shown on the cross section.

We have calculated the capacity of the 8-inch, 10-inch and 12-inch drains assuming between zero and 10 ft. of head at the upstream end at the manifold, with a slope of 0.0025 ft/ft and a free outfall at the outlet. We have calculated that an 8-inch drain could flow at full pipe flow a minimum of 370 gpm with no head above the pipe at the manifold and up to as much as 1,900 gpm with 10 ft. of phreatic head at the manifold. A 10 inch pipe varied between 660 gpm and 3,400 gpm and the 12-inch (drain 6 I.D.) varied between 1,070 gpm and 3,900 gpm. The total capacity of all 12 drains at zero feet of head at the manifold is 7,000 gpm and with 10 ft. of head it is over 30,000 gpm (66 cfs). We have determined that the capacity of drain 6 with 30 ft. of head is as much as 6,800 gpm (15 cfs). The capacity of the drains should be sufficient to conduct a significant amount of seepage water from the embankment with minimal rise in the phreatic water surface. Therefore, we conclude that the statement made by Harding and Lawson would be correct if all of the drains were at full capacity.

If we use the actual flow records as an indication of existing capacity, we have measured flows in each drain that varies between 5 gpm to 10 gpm at low flows and up to 50 gpm to 100 gpm at maximum flows. Drain 6 varies between a high of 1,092 gpm in May of 2008 when the phreatic water surface had risen 35 ft. in piezometer P2 to a low of 50 gpm in September of 2009 gpm when the phreatic water surface was only 1.46 ft. above the bottom of P2. Total combined flows that have been measured from the drains have been between a low of 200 gpm and a maximum of 2,000 gpm. When flows are at 2,000 gpm the phreatic water surface is at its maximum; 35 ft. to 40 ft. above the foundation. If the

capacity of the drains was normal, i.e., all drains were open, at 2,000 gpm we calculate that the maximum head at the manifold would only be 0.5 ft. We calculate that the capacity of drain 6 alone with 2 ft. of head should be 2,000 gpm.

Therefore we conclude that the drain capacity has been compromised by the collapse of the drains and is now dependant on the gravel matrix around the drains and drain 6 to conduct water from the tailings through the embankment and out of the toe drains. A gravel matrix will have a lower transmissivity and conduct water at a lower velocity than an open pipe and it appears to be the reason that the flows in drains 3, 4, 5, 8, 9, 10, 11, and 12 remain fairly low year around and only rise slightly during the spring runoff period. It is apparent that even drain 6 is compromised as it should have been able to pass the highest flows measured with only a 2 ft. rise in phreatic water surface.

The main concern with the drain capacity of the KDID is, as we have previously discussed, there is a 35 ft. to 40 ft. rise in phreatic water surface and 80% to 90% of the total flow from Rainy Creek has established an immediate and direct flow path through the tailings in the reservoir, through the embankment, and into the gravel matrix of each drain that flows, and through drain 6, and flows out of the toe of the dam every minute of every day. As long as the capacity of the drains stays the same and does not change, it may be that the phreatic water surface will remain at the current levels and will never emerge on the downstream face. As we have previously noted, the dam is stable at current phreatic water surface levels.

To date none of the downstream piezometers have recorded water surfaces near the face. Piezometer PM2 which is located at 122 ft. above the toe and approximately 250 ft upstream of the toe of the dam does have water surface elevations that rise as much as 30 ft. above the elevation of the toe but this is still 88 ft. below the ground surface at PM2. The slope between the phreatic water surface in piezometer PM2 and the toe drains would be 0.136 ft/ft. which is a fairly steep slope for groundwater in an earthen dam and indicates that groundwater is drawn down through the embankment and into the toe drains rather than drawn down in the impoundment, drawn down on the upstream face of the dam, or exiting above the drains.

Based on the data from the piezometer, streamflow and drains analysis, the previous toe drain investigation, and the data in this report, we conclude that the water from the impoundment penetrates the embankment. We assume that the water is picked up in original cross drains near the center of the dam and is discharged into drain 6 and partially out the remaining gravel matrix into the remaining drains.

Therefore the integrity of the KDID embankment depends entirely on the ability of the cross drains to collect and discharge the water into drain 6. It is our opinion that the remaining drains have limited capacity and do not have the capacity to discharge any surcharge of water and depend solely on the capacity of drain 6 to discharge the peak flows.

It is our opinion that the maximum capacity of drain 6 in the KDID would not be sufficient to pass large drain flows such as those of a large flood event. We predict that the phreatic water surface may rise to

critical levels in the upstream face and may emerge on the down stream face during major storm events or during high snowmelt runoff years.

Other than drain 6, all other drains are in poor to very poor condition and it the opinion of BHI that they have exceeded their useful life. BHI concludes that the original drain system of the KDID has been compromised and the only component that is relatively intact is drain 6, but we believe its capacity has been decreased. As all other drains are in poor to very poor condition it is the opinion of BHI that there is no factor of safety in the toe drain system and has in fact failed.

It is further our opinion that any form of damaging event such as minor flooding, moderate to minor earthquakes, or a sudden change in internal conditions can collapse another section of drain pipe inside the dam or somehow change how water flows in any of the gravel collars. Any of these events could create an immediate change in the toe drain system. Because of the close connection between the water in the tailings impoundment and the embankment, floods carrying sediment could plug the gravel collars and cause a change in the transmissivity of the gravels which could change how water flows into, or more importantly out of, a drain. Earthquakes could cause other sections of pipe to collapse on the interior of the dam and drains can simply collapse from continual water erosion. Any of these events can cause water to emerge from gravels at the toe, from the down stream face of the embankment above the toe drains, or rise up through the toe area uncontrolled.

It is our professional position that under no circumstances must this particular dam have any water seeping or running uncontrolled on the downstream face, flowing from the gravels or drains at the toe area or upwelling from the foundation at the toe that could cause any form of uncontrolled erosion and sediment transport. Normally if a dam had problems with a drain, they might be able to withstand some forms of erosion and sediment transport from a catastrophic event such as a floods or earthquake before the safety of the dam is compromised. This dam may be able to withstand some erosion and sediment transport before the safety of the dam is compromised but this is not a normal dam because of the limited access, extreme safety measures that must be employed prior to access, and over all danger of the sediments in the embankment. This factor alone hampers the response time enough that normal mitigation measures that must be completed in a rapid manner, can not be done. It is our opinion that the issue of erosion and sediment transport rises to nearly the same level as the over all safety and stability of the embankment.

Therefore we recommend that an alternative drainage system at the toe of the KDID, or a way to bypass the existing drain system, must be investigated and a plan implemented in order to avoid future damage.

APPENDIX 1

SITE PHOTOGRAPHS



1. Roots and cable around drain 7



2. Top of pipe, drain 7



3. Root around drain 7



4. Gravel size on invert of drain 7



5. Drain 7 on top just before excavation



6. Drain 7 at outlet



7. Drain 7 at outlet before removing cottonwood



8. $\frac{3}{4}$ " minus round gravel around drain 7



9. Gravel around drain 7



10. Same as #9



11. Gravel under drain 7



12. New outlet for drain 7



13. New fill over drain 7



14. Same as #13



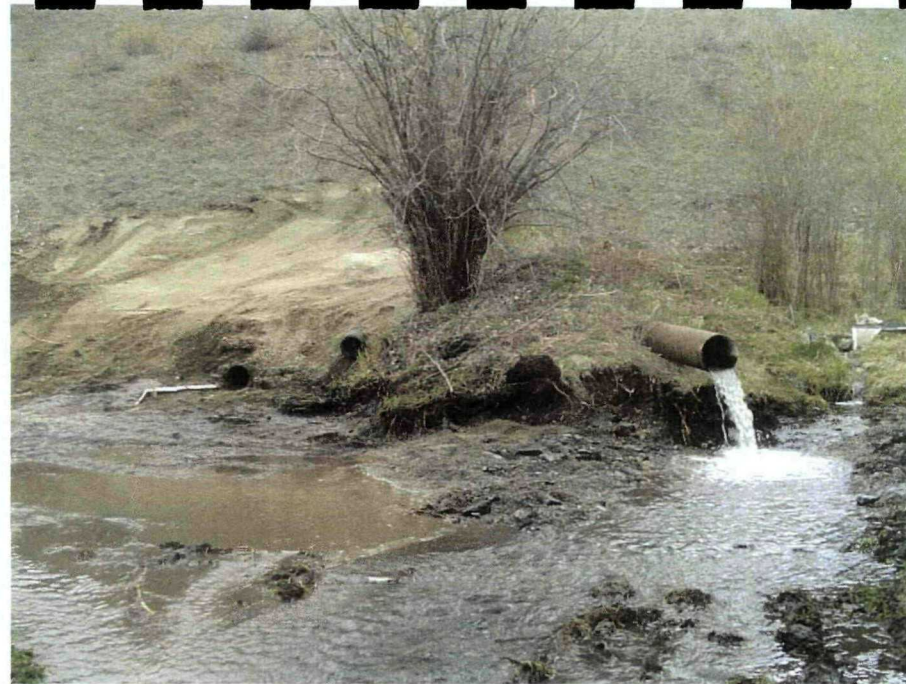
15. New outlet drain 7



16. Same as #15



17. Final fill over drain 7



18. Final grading, drain 8, drain 7, & drain 6



19. Same as # 18



20. Across from drain 7



21. Side view final grades, drain 7



22. Same as #21



23. Material inside drain 2



24. Inside drain 2



25. Outlet of drain 2, 12-inch culp



26. Same as #25



27. Same as #25



28. Drain 2 after cutting



29. Pieces of drain 2



30. Inside drain 2



31. Backfilling drain 2



32. Outlet of drain 2 near drain 1



33. Terminal end of drain 11



34. Same as #33



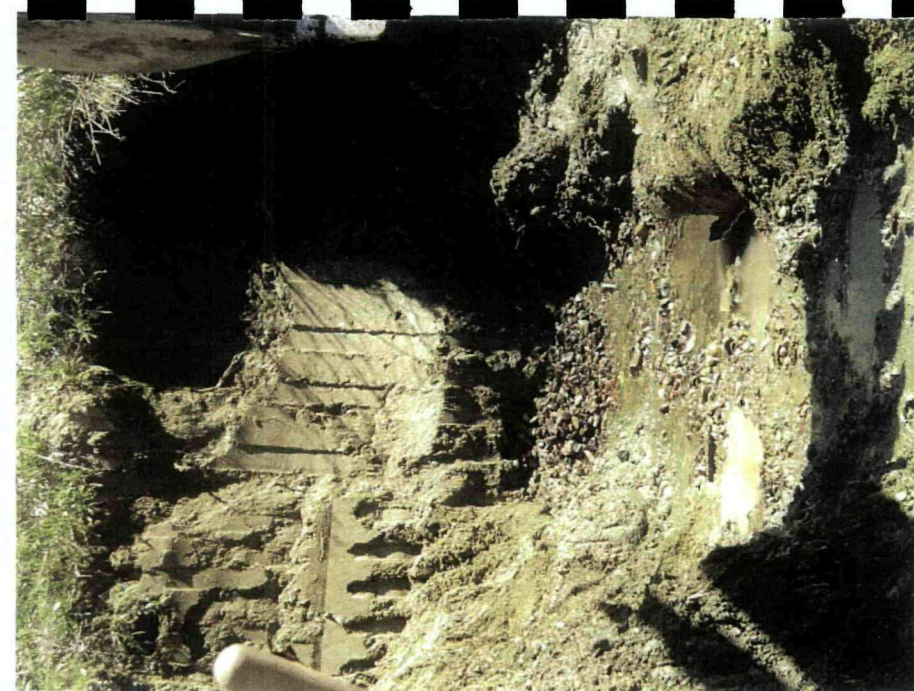
35. Excavating near drain 11



36. Same as #33, note end of drain 10



37. Terminal end, drain 14 and drain 10



38. Same as # 37



39. Same as # 37.



40. Placing round rock and new outlet drain 11



41. Same as #40



42.



43. Final grade, drain 11 & drain 10



44. Same as #43



45. Final grade, drain 3



46.



47. Fill near drain 2 & drain 1



48. Same as # 47



49. Outlet of drain 3



50. Same as # 49



51. Same as # 49



52. Drain 3 being excavated



54. Drain 3 at outlet



55. Same as #54



56. New outlet on drain 3 with broken concrete



57. Same as #56



58. Same as #57



59. Backfilling drain 3



60. Same as #59



61. Note 1 1/2" round rock near drain 3



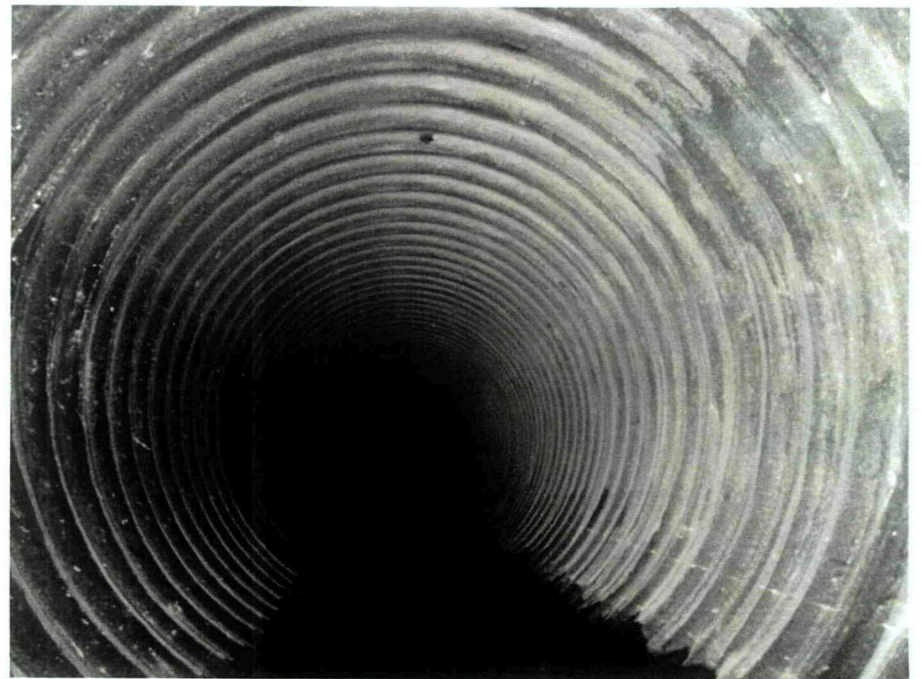
62.



63. Backfill, drain 3



64.



65. Inside new outlet, drain 3



66. $\frac{3}{4}$ " minus fill material



67. Excavation at drain 2



68. Drain 2, 18-inch CMP



69. Cut in drain 2 from shovel



70. Same as #69



71. Same as #70



72.



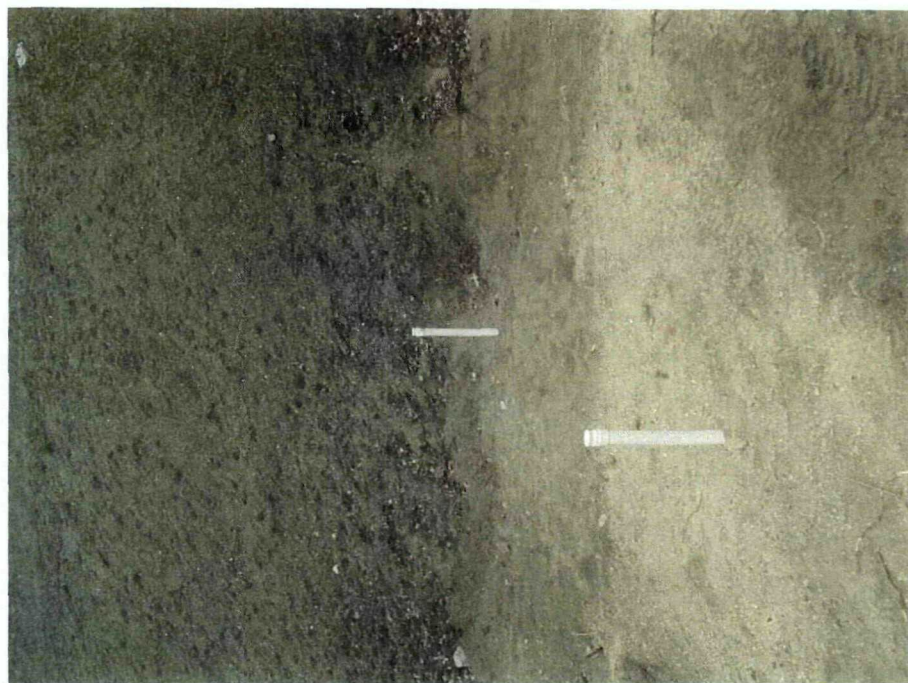
73.



74.



75. Excavation near drain 2 for A9



76. New piezometers A9 & A10



77. A9 & A10 near drain 2 and drain 1



78. Same as #77



79.



80.



81.



82. Finish grade, drain 3



83. Finish grade drain 2 and drain 1



84. Drain 3



85. Finish grade, drain 6



86. Finishgrade, drain 2 and drain 7



87. Same as # 86



88. Same as # 87.



89.



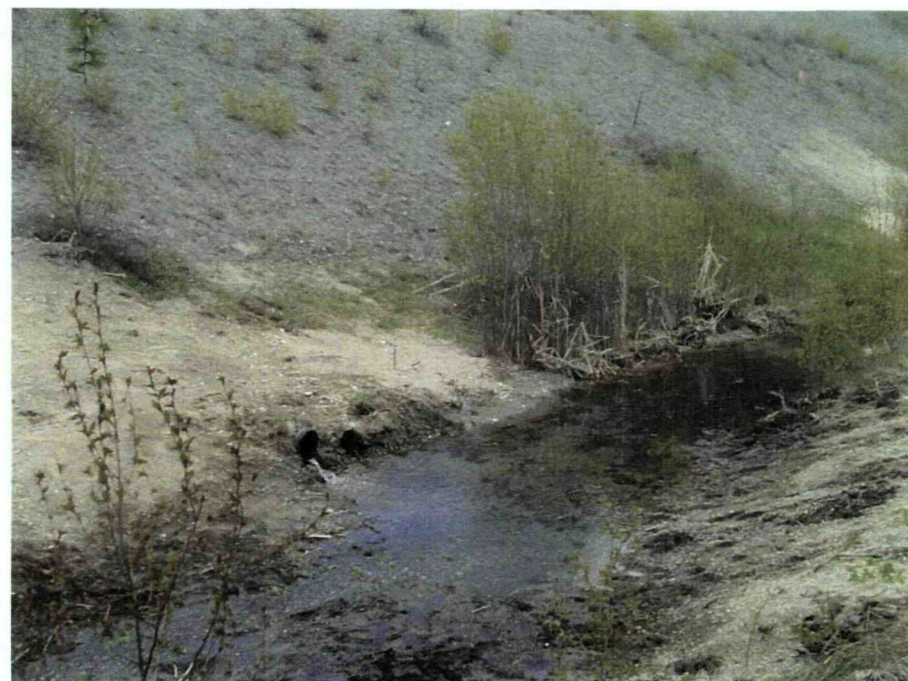
90. Finish grade, drain 11 and drain 10



91. Same as #90.



92. Same as #91



93. Same as #92



94. Channel below drain 10, cleaned



95. Same as # 94



96. Finish grade, drain 8, and drain 7



97. Finish grade, drain 7. Note water below drain



98. Drain 7, new outlet, water below drain



99. Finish grade, drain 2



100. Finish grade, drain 3



101. Clean up near drain 6



102. Piezometer A11 location



101. Piezometer A11



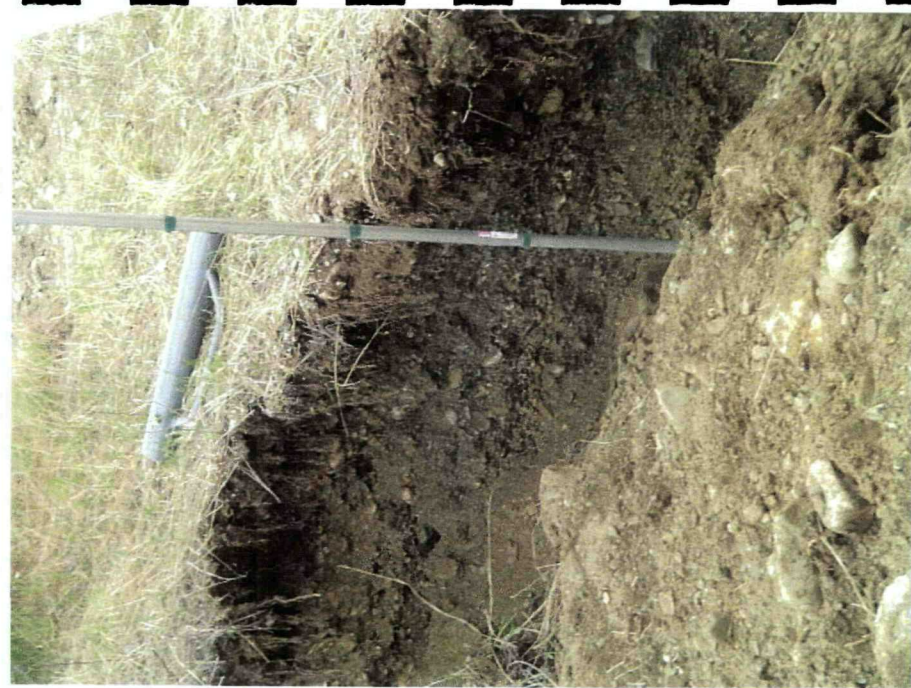
102. Same as #101



103. Same as # 102



104. Water bearing gravel near A11



105. Same as #104



106. Outlet drain 2 and drain 1



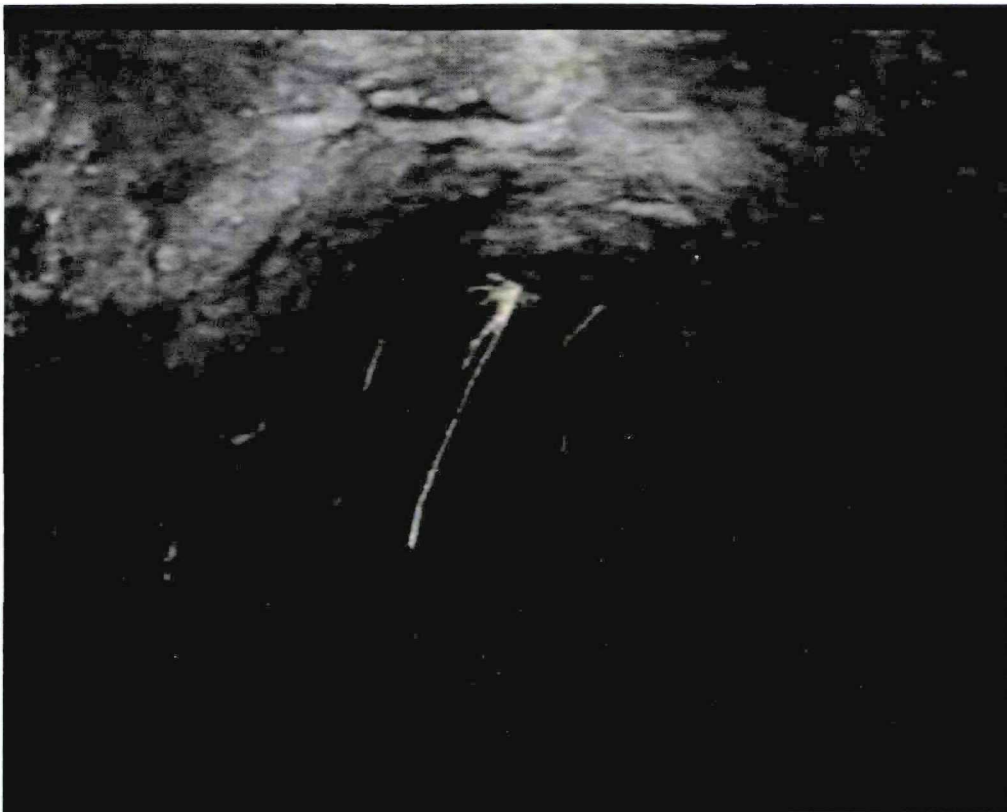
107. Piezometer A9



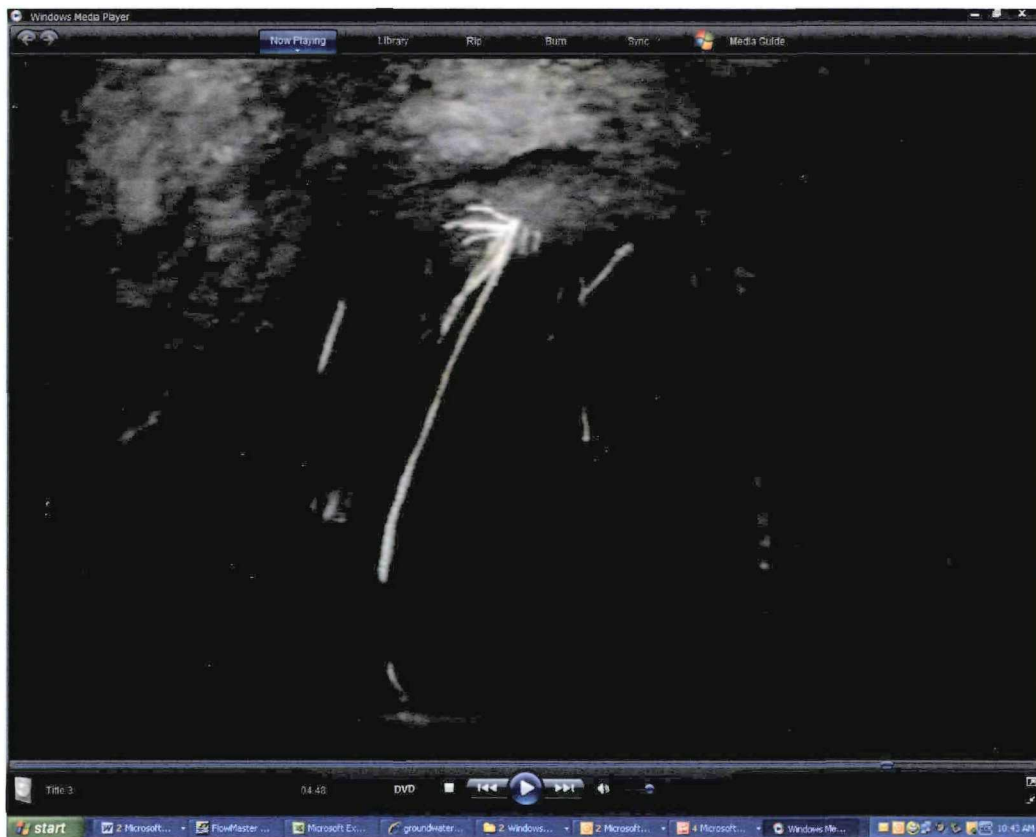
108. Piezometer A11

APPENDIX 2

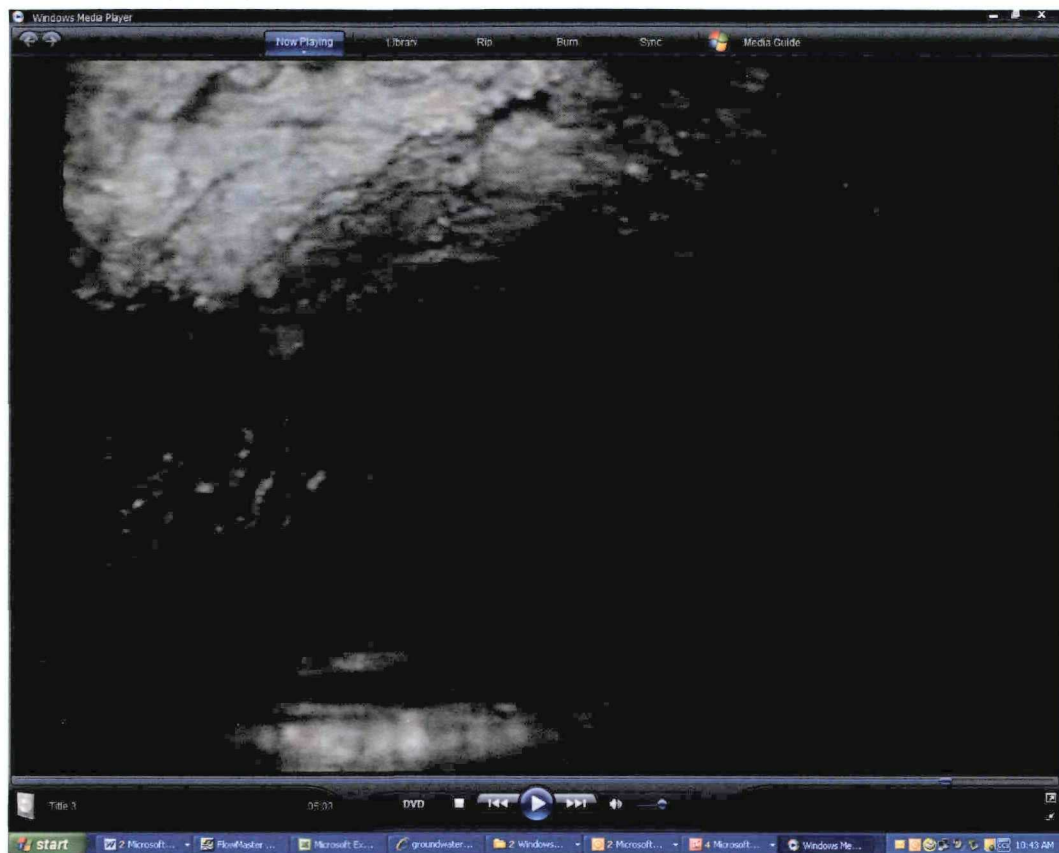
STILL PHOTOGRAPHS FROM VIDEO



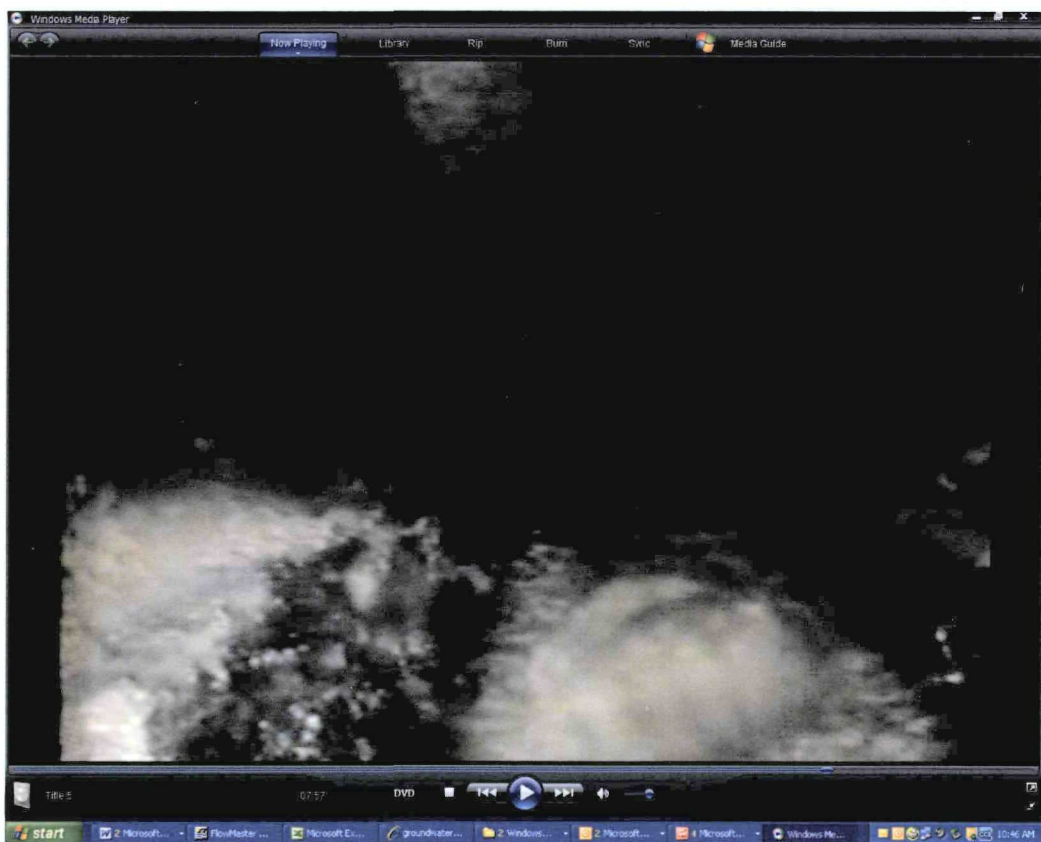
Drain 3: Transition into water at 32 ft.



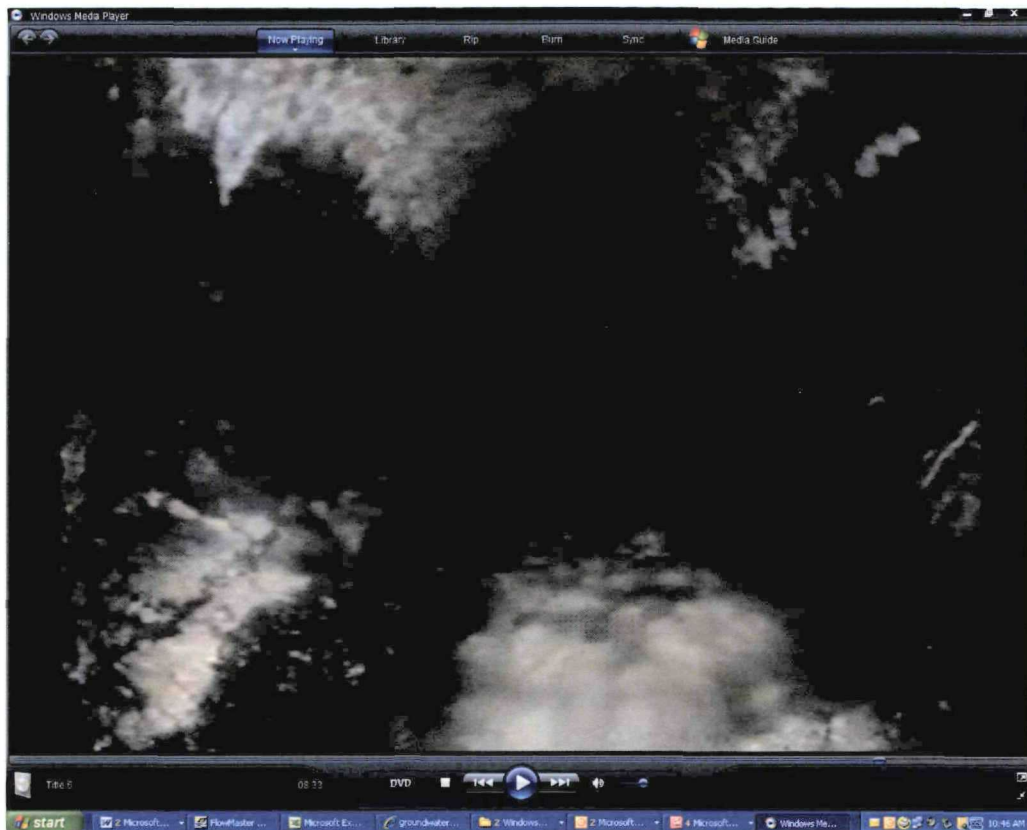
Drain 3, same as above



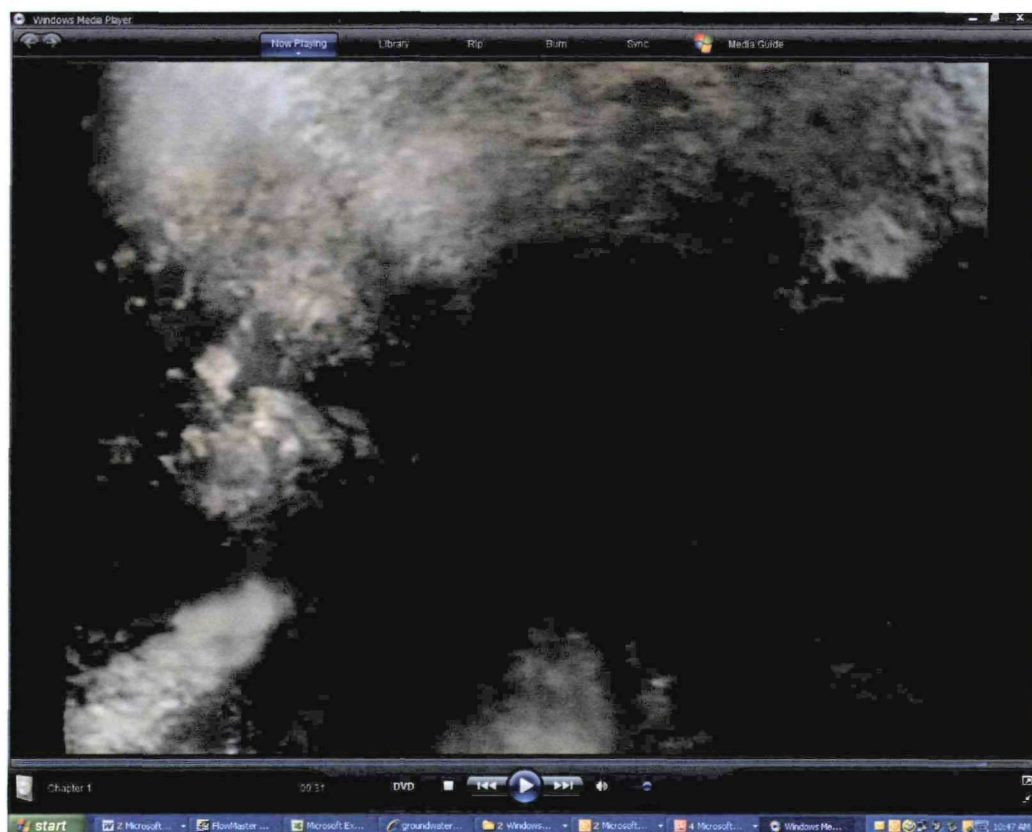
Drain 3, closer to transition into water



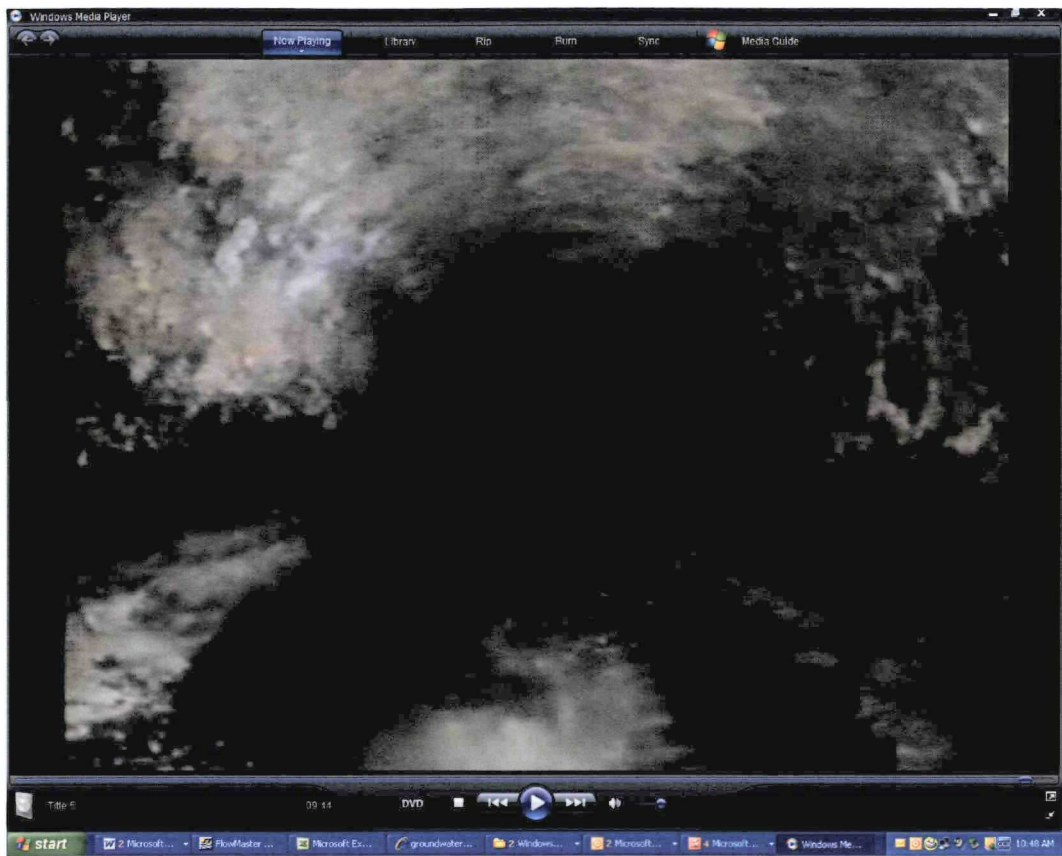
Drain 3 beyond low area and into pipe, approximately at 54 ft.



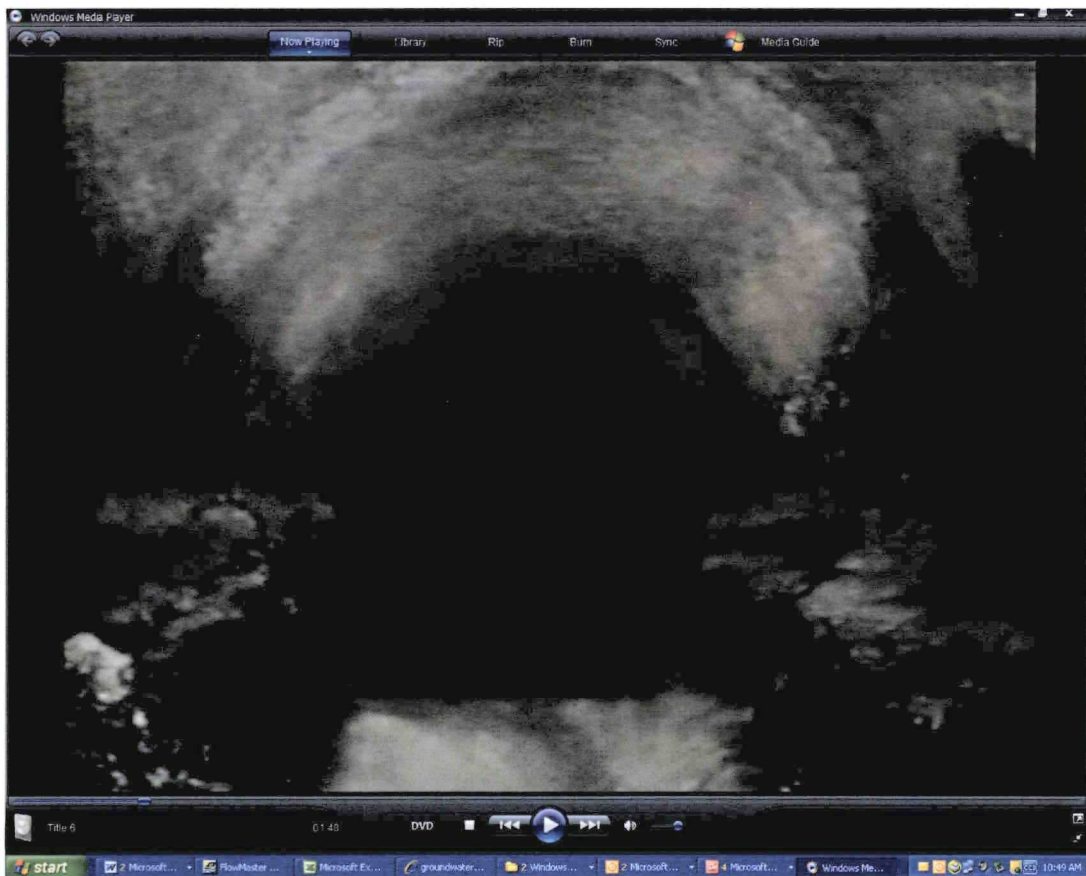
Drain 3 same as above



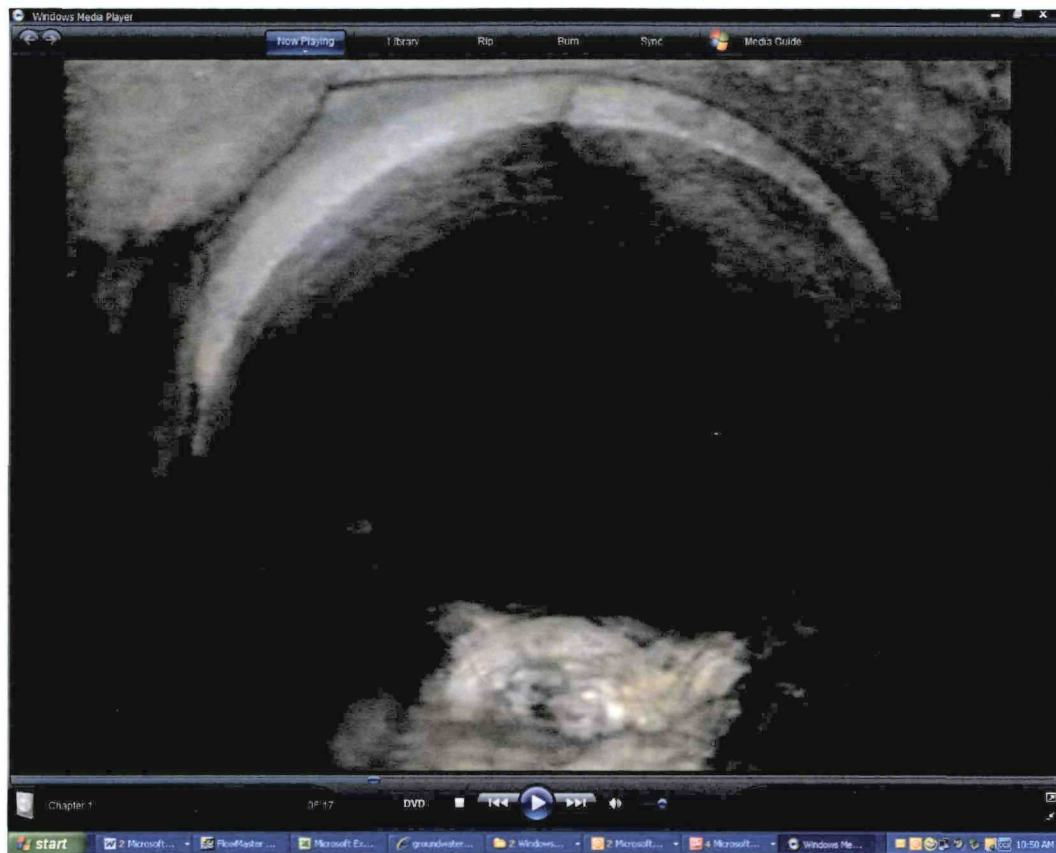
Drain 3 at approximately 65 ft. from outlet



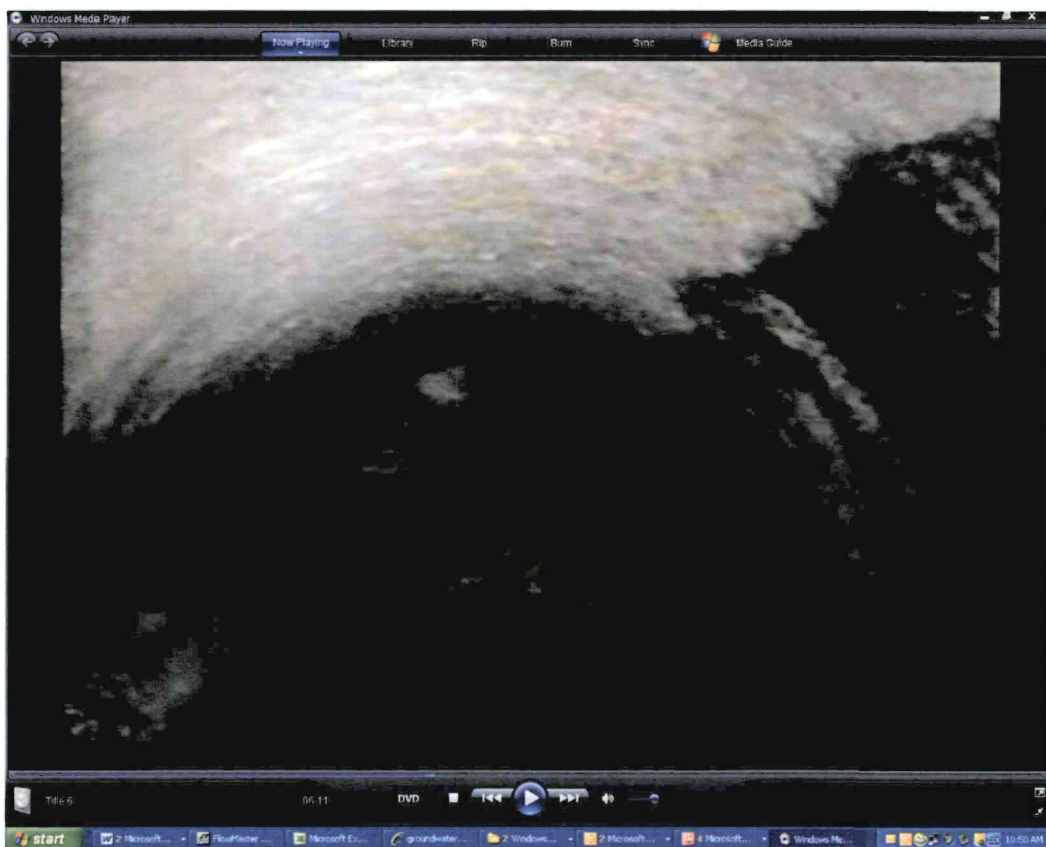
Drain 3 approximately 76 ft. from outlet



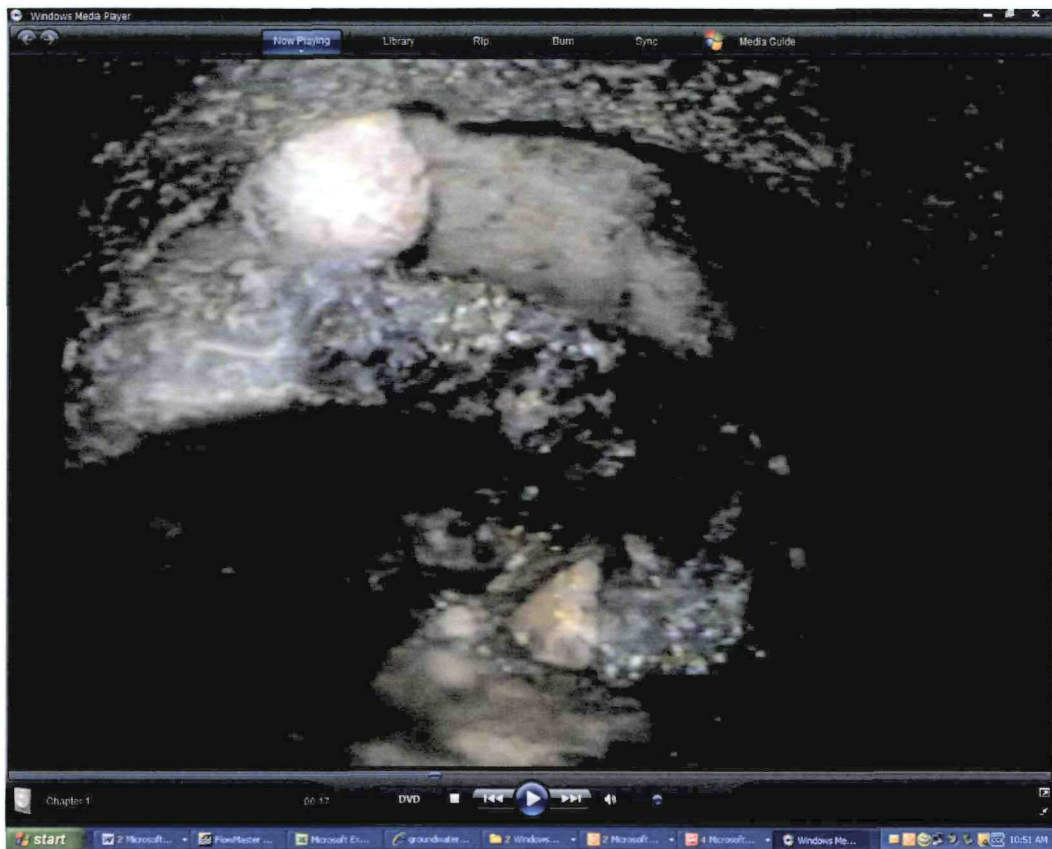
Drain 3, approximately 95 ft. from outlet



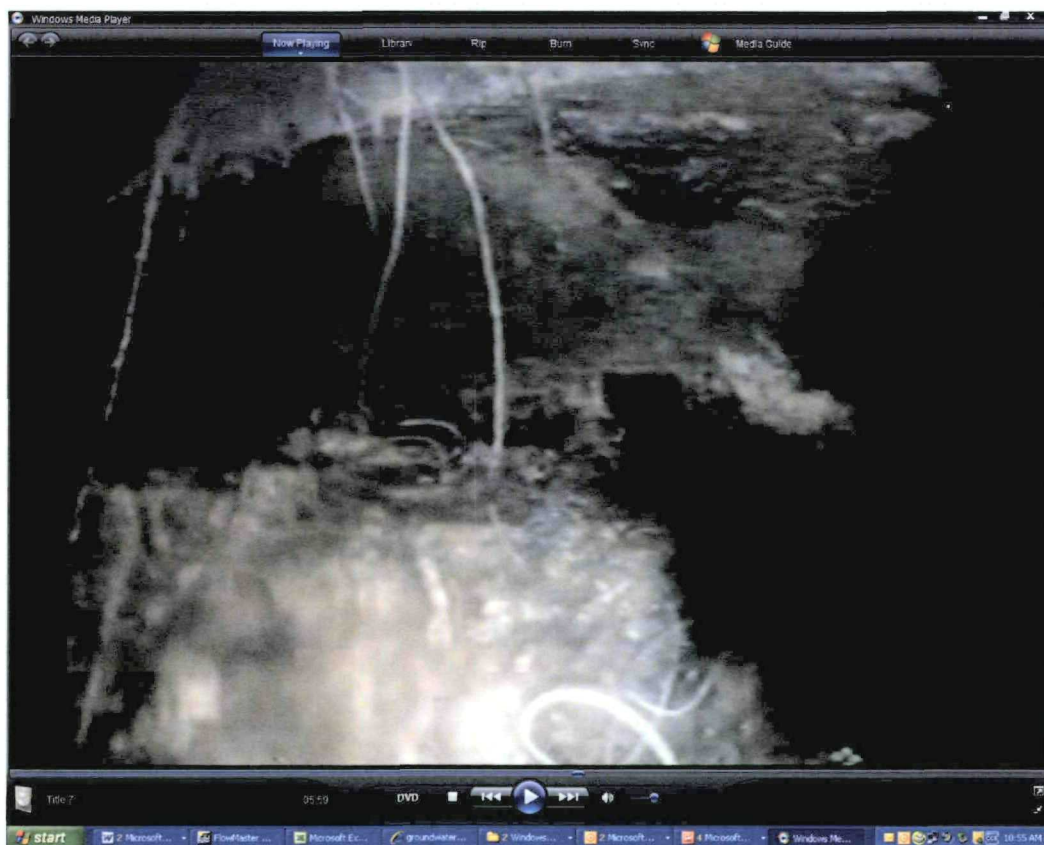
Drain 3 137 ft. from outlet



Terminal End Drain 3, 142 ft. from outlet



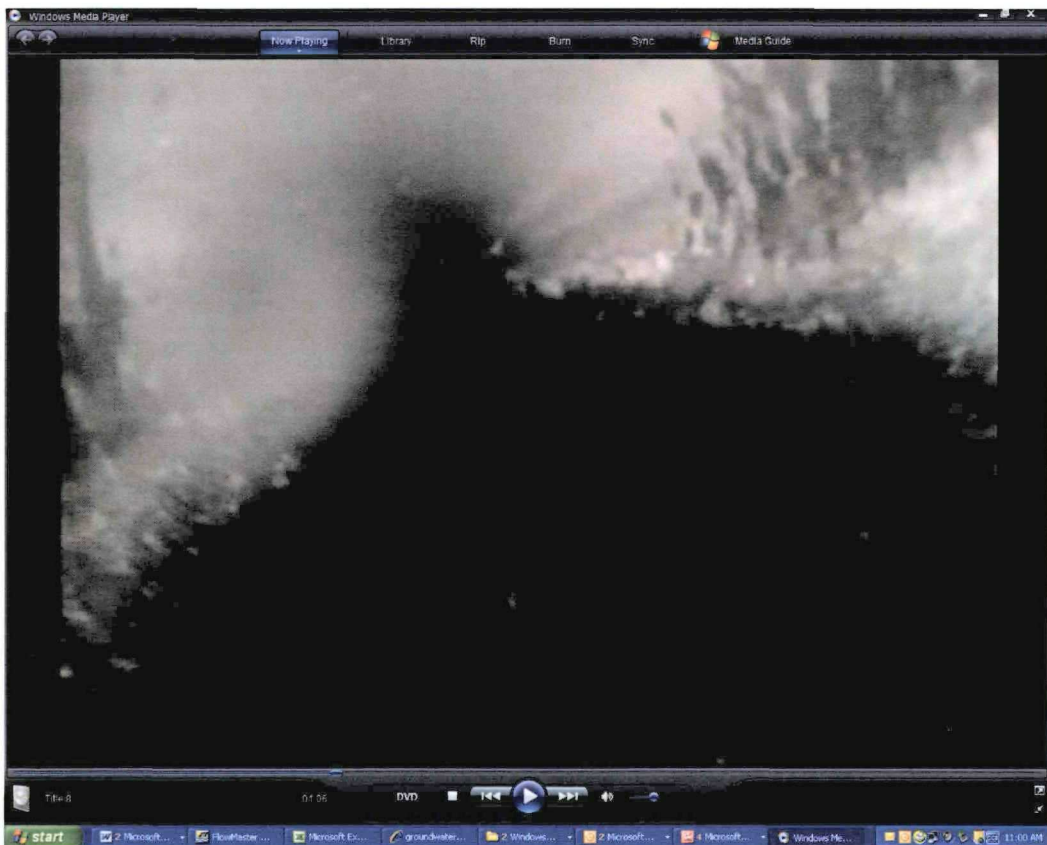
Terminal End of Drain 3, broken Concrete Pipe



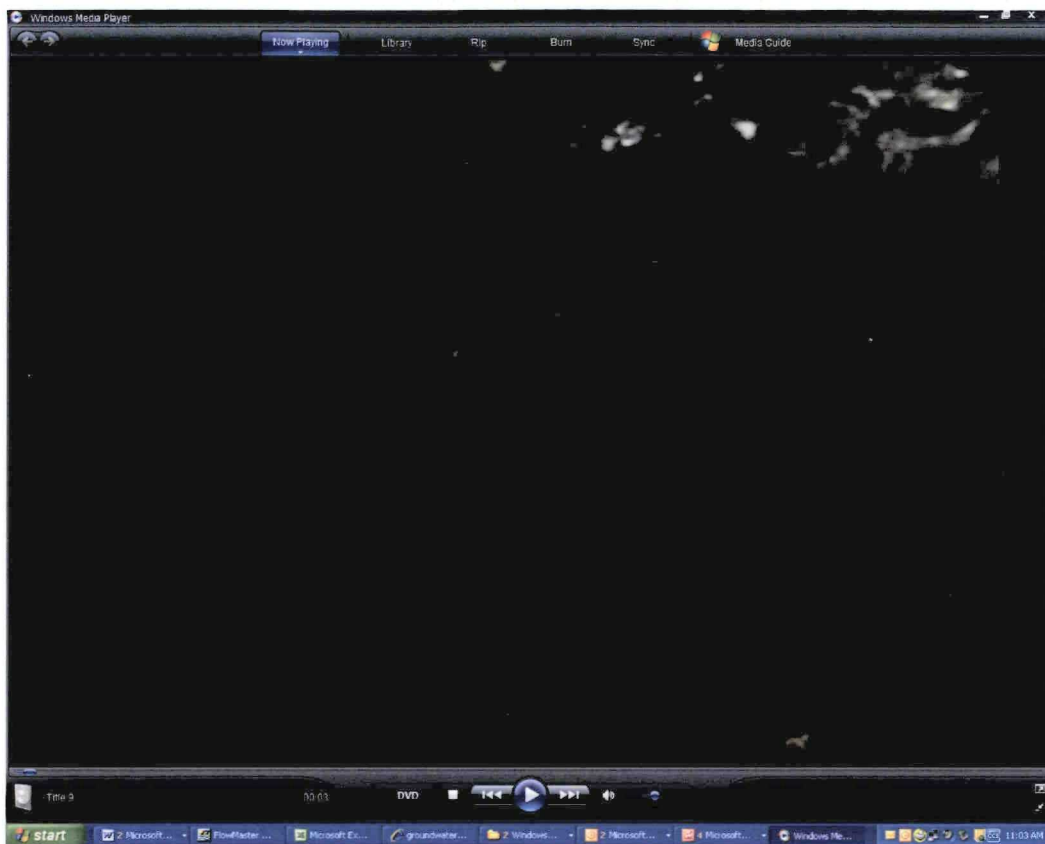
Terminal End of drain 2



Broken concrete pipe, root and debris at the terminal end of drain 2.



Inside drain 6 at outlet end



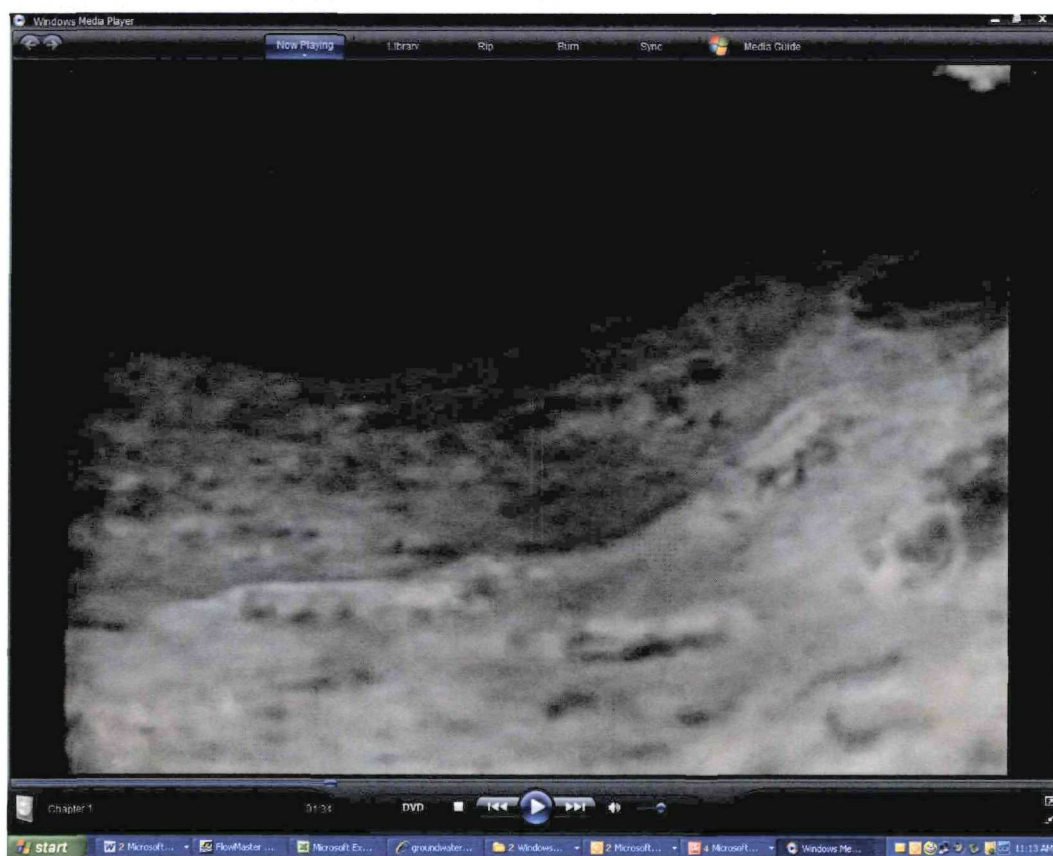
Flow Turbulence and invert of drain 6



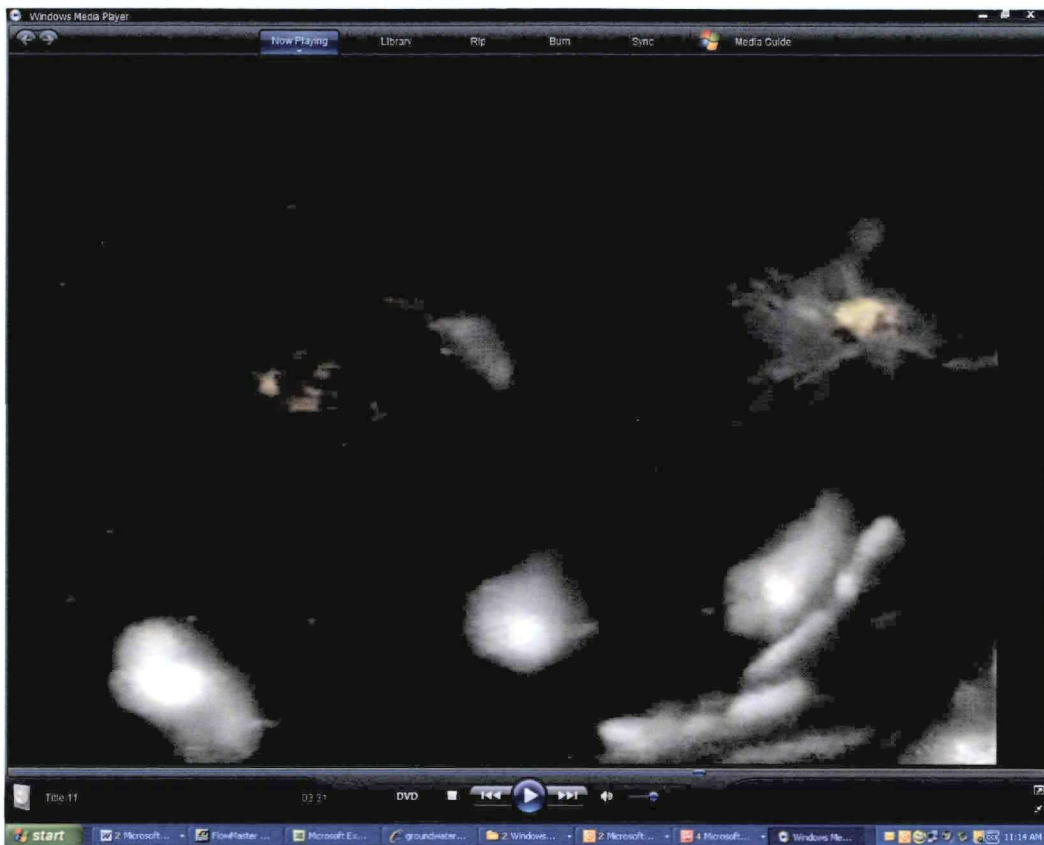
Invert of drain 6 at 280 ft.



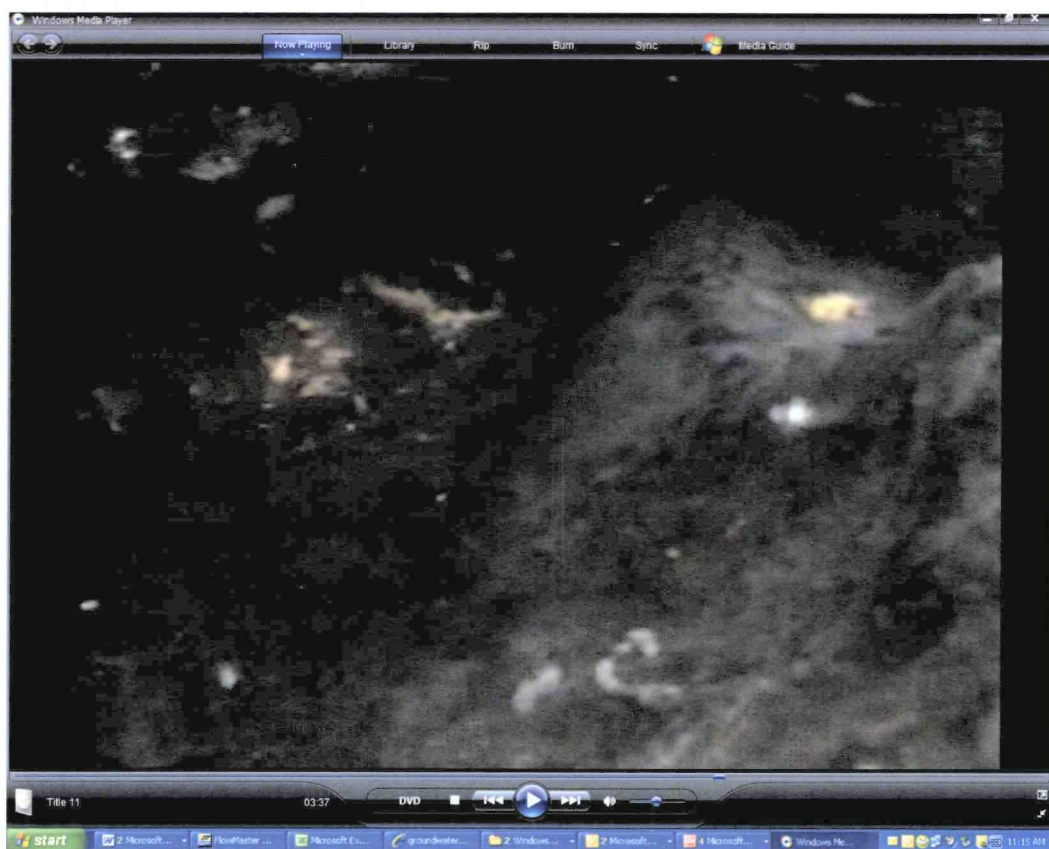
Sediment deposits in drain 6 at 300 ft. from outlet.



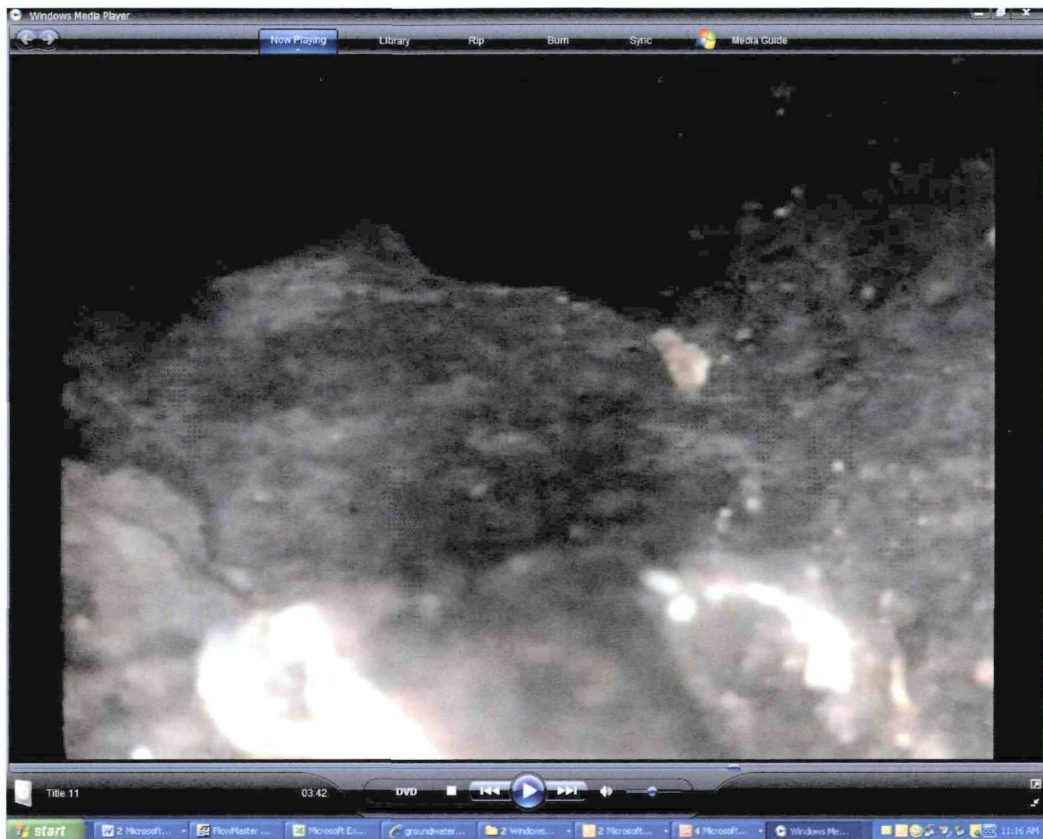
Sediment deposits in drain 6 at 320 ft. from outlet.



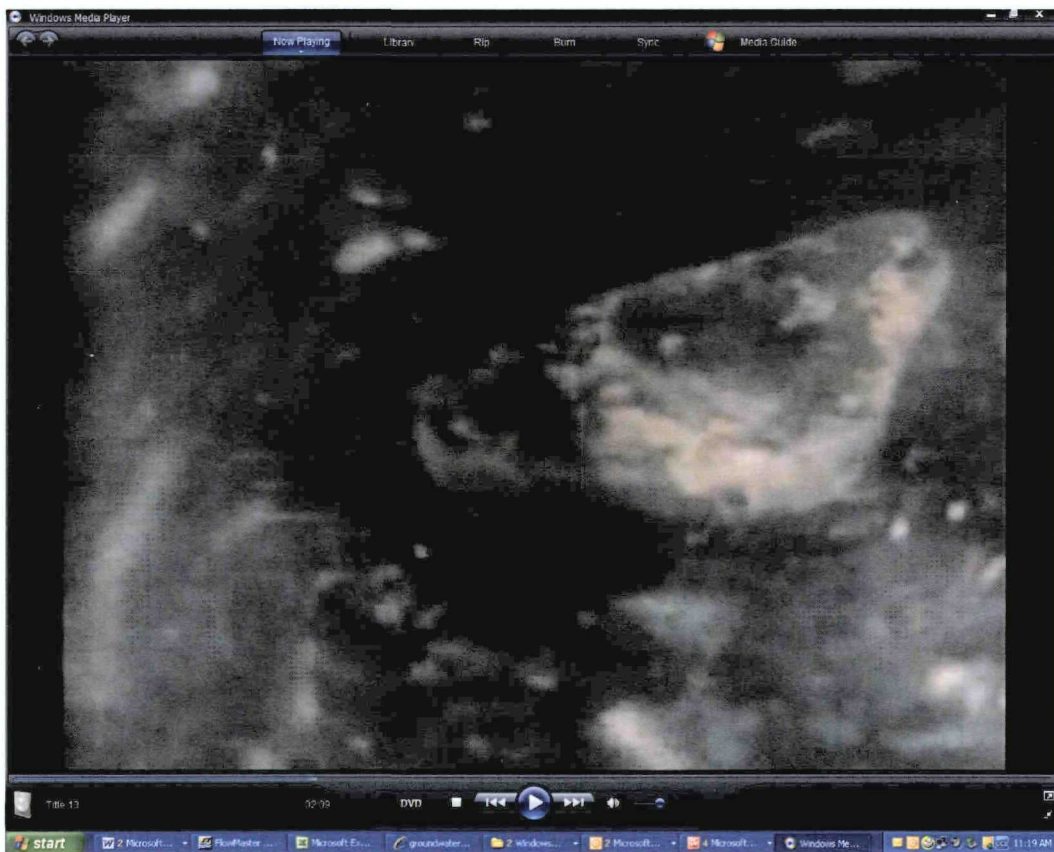
Sediment deposits near cross drain at 342 ft. into drain 6



Enhanced photograph above



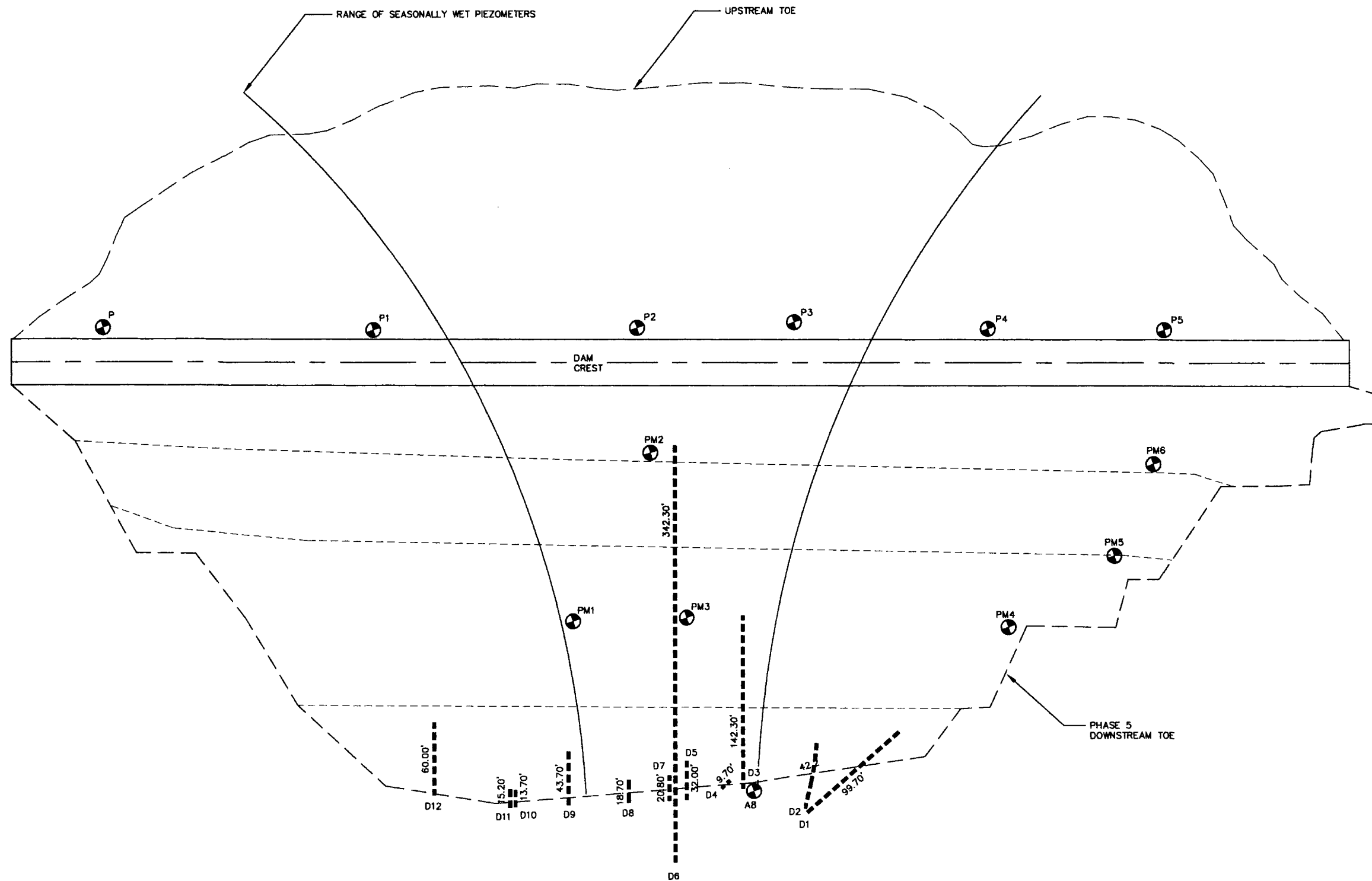
Sediment deposits just upstream of cross drain at 352 ft. in drain 6



Rock dislodged in drain 6 while withdrawing camera

APPENDIX 3

DRAIN LOCATION IN CROSS SECTION AND PLAN VIEW DRAWINGS

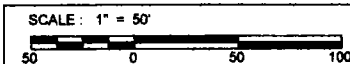


EXISTING KDID TOE DRAINS

LEGEND:

--- PHASE 5 ADDITION DRAIN

● PIEZOMETER LOCATIONS



KDID TOE DRAIN INVESTIGATION FOR THE **REMEDIUM GROUP**

T. 31N. R. 30W. P.M. LINCOLN COUNTY, MONTANA



BILLMEYER & HAFFERMAN, INC.
1181 THIRD AVE. E. SALT LAKE CITY, UT 84111
PHONE: (801) 885-5700
FAX: (801) 887-8710
EMAIL: info@billmeyer.com
URL: http://www.billmeyer.com

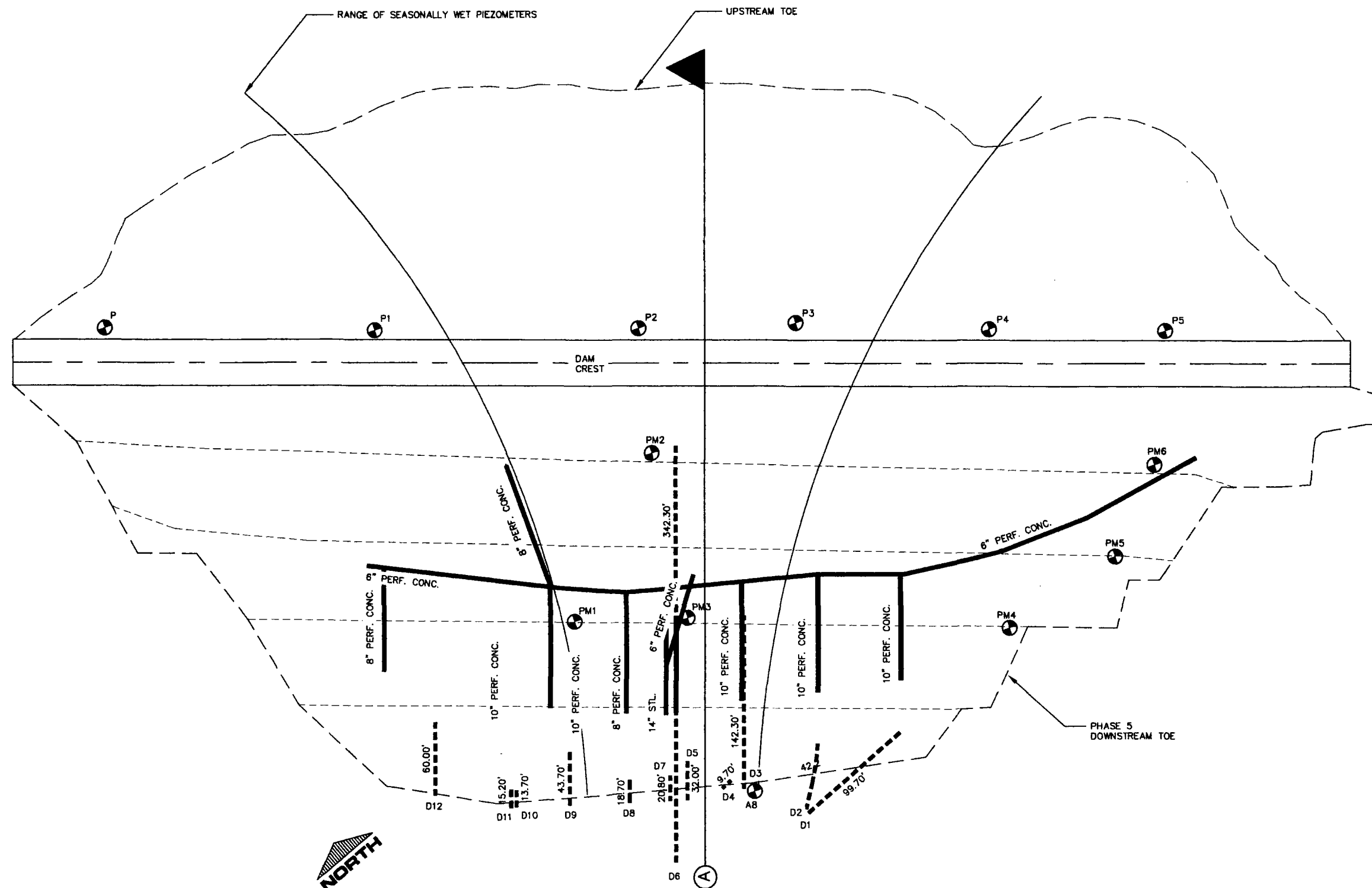
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**TOE DRAIN
INVESTIGATION**

SCALE:
AS SHOWN

DATE: JUNE 21, 2010 PROJECT NO: R.56.1

DRAWING NUMBER:
1 of 4



EXISTING & PHASE 5 KDID TOE DRAINS COMPARISON MANIFLOD IN PLAN LOCATION

LEGEND:
 - - - - - PHASE 5 ADDITION DRAIN
 ——— EXISTING DRAIN
 ⊕ PIEZOMETER LOCATIONS

SCALE: 1" = 50'
 50 0 50 100

KDID TOE DRAIN INVESTIGATION

FOR THE
 REMEDIUM GROUP
 T. 31N. R. 30W. P. 1M. LINCOLN COUNTY, MONTANA

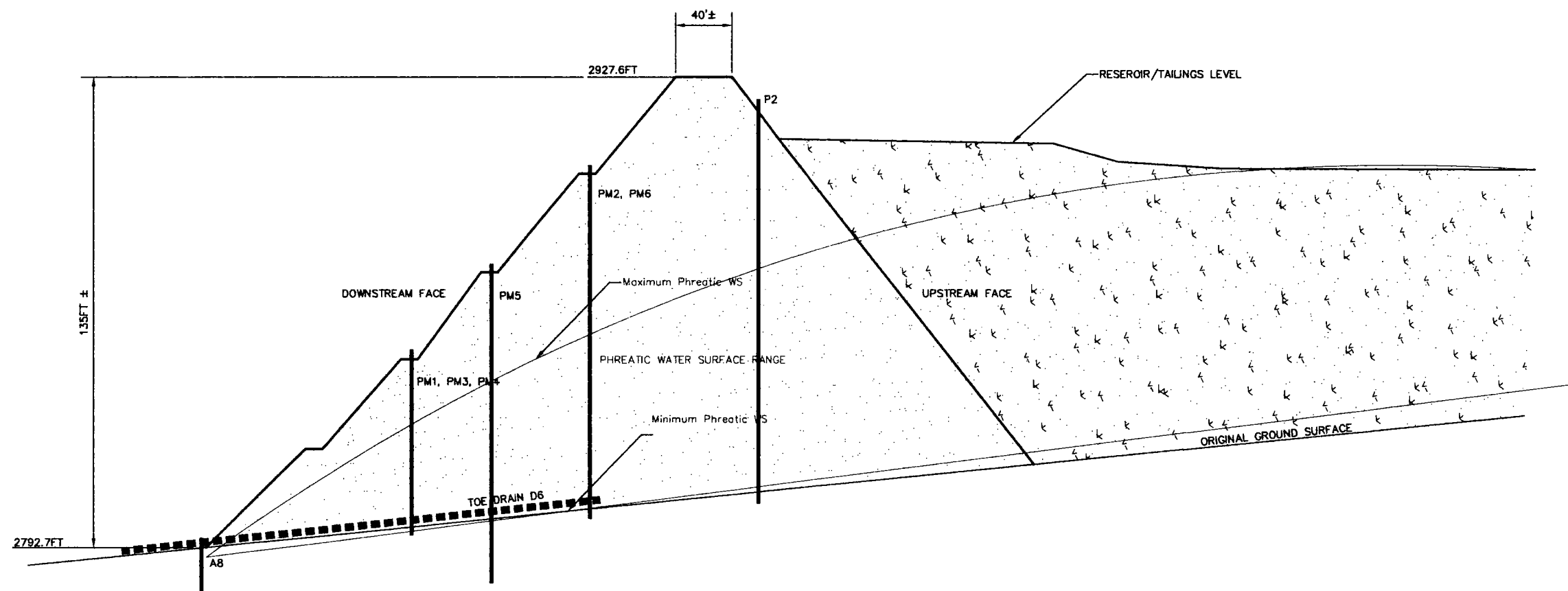
BH
 BILLMAYER & HAFFERMAN, INC.
 2181 THIRD AVE. E. KALISPELL, MT. 59901
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 TOE DRAIN
 INVESTIGATION

SCALE:
 AS SHOWN
 DATE: JUNE 21, 2010 PROJECT NO: R.56.1

DRAWING NUMBER
 2 of 4



KDID DAM X-SECTION "A"
NTS

KDID TOE DRAIN INVESTIGATION
FOR THE
REMEDIUM GROUP

T. 31N. R. 30W. P.M. LINCOLN COUNTY, MONTANA

BH
BILLMAYER & HAFPERMAN, INC.
2101 11000 AVENUE E. BAINBRIDGE, MT. 59011
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**TOE DRAIN
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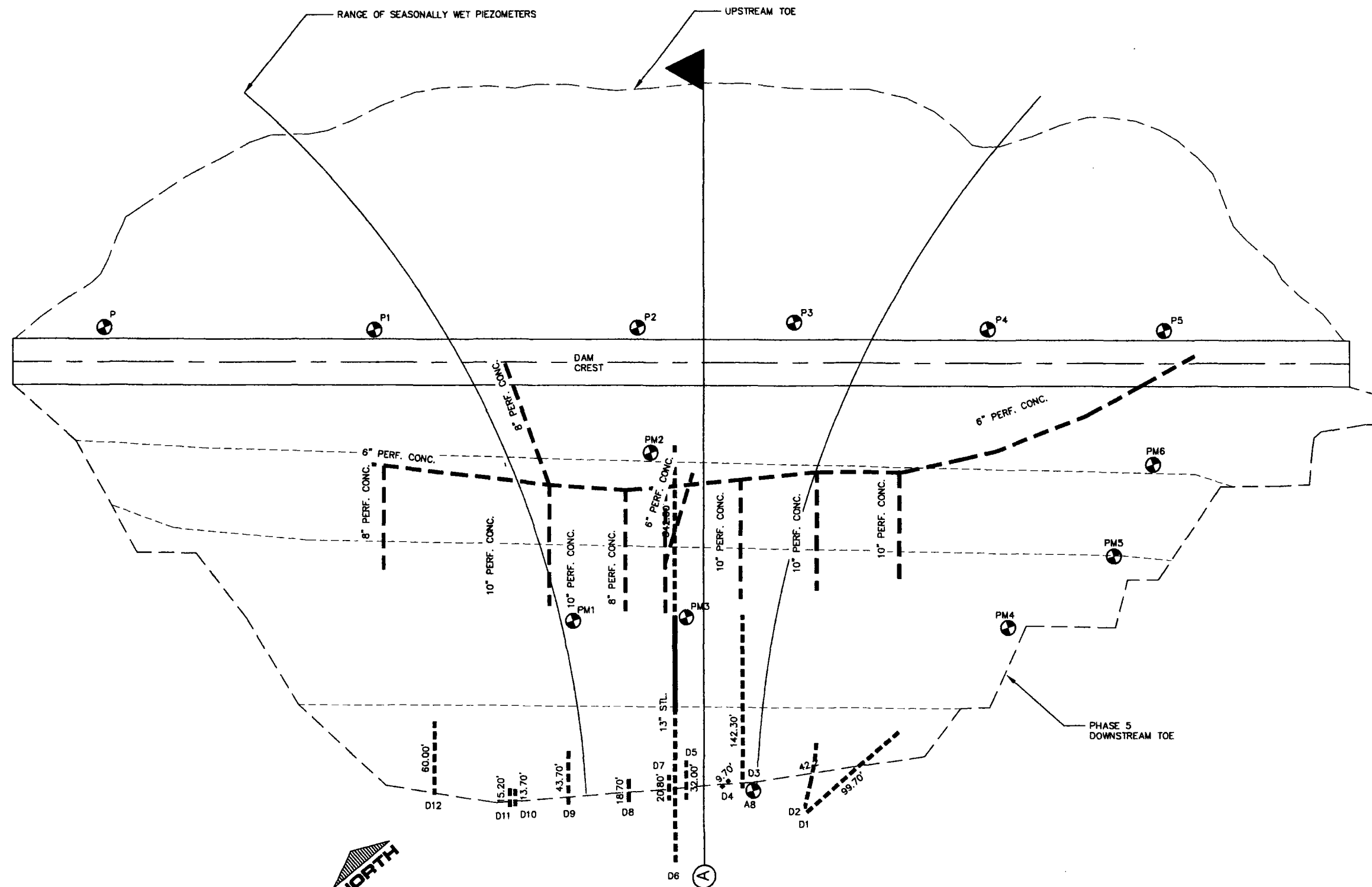
SCALE:
AS SHOWN

DATE: JUNE 21, 2010 PROJECT NO: R.56.1

DRAWING NUMBER:

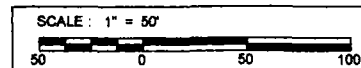
3 of 4

R.56.1.dwg - DAM DETAILS.dwg



EXISTING & PHASE 5 KDID TOE DRAINS COMPARISON MANIFLOD MOVED TO FOUND LOCATION

- LEGEND:**
- PHASE 5 ADDITION DRAIN
 - EXISTING DRAIN
 - ⊕ PIEZOMETER LOCATIONS



KDID TOE DRAIN INVESTIGATION II FOR THE **REMEDIUM GROUP**

T. 31N, R. 30W, P.M. 1, LINCOLN COUNTY, MONTANA

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DRAWING TITLE:
**TOE DRAIN
INVESTIGATION**

SCALE:
AS SHOWN
DATE: JUNE 21, 2010 PROJECT NO: R.56.1
DRAWING NUMBER:

APPENDIX 4

CD OF VIDEO INSPECTION

TARGET SHEET
EPA REGION VIII
SUPERFUND DOCUMENT MANAGEMENT SYSTEM

DOCUMENT NUMBER: 1192613

SITE NAME: LIBBY ASBESTOS SITE

DOCUMENT DATE: 08/03/2010

DOCUMENT NOT SCANNED

Due to one of the following reasons:

- ☐ PHOTOGRAPHS
- ☐ 3-DIMENSIONAL
- ☐ OVERSIZED
- ☒ AUDIO/VISUAL
- ☐ PERMANENTLY BOUND DOCUMENTS
- ☐ POOR LEGIBILITY
- ☐ OTHER
- ☐ NOT AVAILABLE
- ☐ TYPES OF DOCUMENTS NOT TO BE SCANNED
(Data Packages, Data Validation, Sampling Data, CBI, Chain of Custody)

DOCUMENT DESCRIPTION:

1 DVD - MAY 21, 2010 VIDEO DRAIN 3, DRAIN 2 AND DRAIN 6
